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The
GEOGRAPHICAL JOURNAL

Vol LXXXIV No 6



December 1934

LAZISTAN AND AJARISTAN: *A paper read at the Evening Meeting of the Society on 14 May 1934, by*

W. RICKMER RICKMERS

LAZIA is a convenient name for the shorelands of the south-eastern bight of the Black Sea from Batum to Trebizond. For historical reasons Lazia stands as the wider term, embracing Ajaristan on the right bank of the Chorokh river and Lazistan proper on the left. The Lazis and Ajars belong to the Mingrelian branch of the Georgian or Karthli people. As occupiers of the coast it was the Lazis who came in touch with travellers, traders, and warriors, to whom Ajaristan remained the country at the back of beyond. But if we advance from the interior, Lazistan becomes an outpost of Georgia and therefore an extension of Ajaristan (Guria). To Georgian administrators and historians the two have been more or less one. So from both points of view, from outside as well as from inside, Lazica, Lazistan, or Lazia was the whole.

At one time Lazia reached to Sinope (Paphlagonia) or about as far as the Pontic range. That was Georgia's tendril towards union with Byzantium. The Turks cut it off. Nevertheless the deep trench of the Chorokh river has always maintained a subdivision more especially during the Russian occupation of Ajaristan from 1878 to 1921. The Russians called it Turkish (*i.e.* Muhammadan) Gruzia, a term which included Lazistan.

The racial name covers a fairly uniform landscape determined by mountains averaging 10,000 feet and the humid climate of the western Caucasus. On the map it means a sweep of the brush, clear enough as a whole but not naturally defined by a sharp line. How could it be otherwise when the name of a people reflects a history which can be traced back for two thousand years. Old Lazia up to the Rion river is one with the Colchis of the early Greek explorers whose feats in the dim past have been more or less truthfully condensed into the saga of the Argonauts. To this day the Princes Dadian of Mingrelia bear the golden fleece in their coat of arms.

Russia, which had incorporated Georgia in 1801, acquired Ajaristan by the Treaty of San Stefano (1878), but lost it again to Turkey in 1921. As united under Turkey Lazia is now almost one again with ancient Colchis. Thanks to her position Lazistan has always enjoyed much independence. Even the Russian General Paskievich failed here in 1828. Only the notorious Abdullah

Pasha of Trebizond was able to overawe the Lazis. As a former Pontic chieftain he evidently knew how to deal with them, while his Turkoman blood made him liberal in the choice of means. Thus Lazia, although practically unknown to the modern world, looks back upon a lively past. Herself hardly ever the main object of important campaigns, she happened to occupy ground where the scene-shifters hurried to and fro. (There she lay like a sandbank, where eddied and whirled the political currents directed towards higher aims.) Since their arrival there in pre-Christian times the Lazis have been disturbed but not removed.

It speaks well for the Georgian race as a whole that they have preserved their nationhood in spite of their unfortunate position on the Caucasian isthmus where the drums of Asia reverberated from the cliffs of Kazbek on their way to the Mediterranean. It may however have helped the Georgians that they fought with their backs to a big wall. I cannot imagine any real migration across the mighty Alps of the Caucasus, and the mountain tribes as remnants. I believe them rather to be infiltrations caused by Asiatic pressure.

Lazia was a place where the great powers met. But the empires have vanished, and Lazistan still stands. Until recently Lazistan and Ajaristan were separated by the Russo-Turkish frontier. Since 1921 the whole belongs to the *vilayet* of Trebizond. Lazia, as part of Turkey-in-Asia, is an easy if unsatisfactory escape from the difficulty of assigning it to a larger topographical unit. Writers place it in Asia Minor, Caucasia, Transcaucasia, the Little Caucasus, or Armenia according to the starting-point of their train of thought. The best plan would be to start from the centre, namely Armenia, which by overlapping them all saves us from the quandary of defining limits to Asia Minor, Caucasia, and Iran. By rule of thumb doubtful topographical cases hereabouts are classified under Armenia. So let it be with Lazia, all the more as under the Roman Empire (A.D. 14-117) it fell under the general term of Armenia Minor.

Ajaristan and Lazistan are clannish distinctions, for their tribes sprouted from the same branch. The country forms a belt from 30 to 50 miles wide, hugging the coast from Trebizond to the mouth of the Chorokh. Its many names bear witness to the importance of this river: Chorokh, Boas, Acampsis, Lycus, Ispiris. Dense settlement by Lazic stock only goes as far as the Kalopotamos west of Rize (Riza). It is easier to sift the Lazis from the Turks and Armenians, whereas close kinship with the Gurians and Mingrelians makes it difficult to round off the Ajarian section.

But several prominent features enable us to circumscribe Lazia, or Ajaristan and Lazistan. The borders of Lazia are formed by the coast of the Black Sea, by the rivers Kalopotamos and Chorokh, and by various ridges of the Mezkhic mountain system (Little Caucasus) running in and out like the bastions of a fortress. This Lazia thus defined agrees remarkably well with Lazia the landscape. Trifling intrusions apart, Lazia contains nothing foreign to the regions of climate, vegetation, and humanity which together make the Pontic landscape.

As to maps I need only mention the following: Russian 1 : 210,000 (five-verst) since 1880; British War Office 1 : 250,000; Turkey in Asia, Sheets Tortum and Batum, 1902; Kiepert, Kleinasien 1 : 400,000, Sheet A VI, 1913;

Turkish Military 1 : 200,000, Sheets Ispir, Rize, Artvin, Olti, 1911-12; Russian War Office reprint 1 : 210,000 (slightly reduced) of the preceding map, dated 1915. The Turkish map seems to be the best. Whether it has been pieced together or whether it forms a strictly co-ordinated whole remains to be shown. Surveying in Lazistan is very difficult owing to mists and shifting clouds. The map accompanying this paper has been compiled by the R.G.S. from the above material supplemented by contributions from Ludwig Krenek, Dr. Bege, and Dr. Leutelt.

In the way of leading features the map of Asia Minor has nothing much to offer save the Taurus and the Pontic range. The latter gets clear of the Paphlagonian shore and curves upwards to the Mezkhic range, the northern boundary of Ajaristan. Here the Suram watershed forms a bridge to the Great Caucasus. Two trends, coast and ridge, determine the shape, weather, plant life, humanity, and traffic of Lazia between the bleak dry uplands of Armenia and the sodden breath of the Black Sea. Ajaristan is a maze of wooded hills dominated by rocky pinnacles. Near its centre rises Karchkhal (3800 metres). Lazistan runs with the loftiest portion of the Pontic range—the Paryadres and Scydises of the ancients—culminating in Kavron-dagh (3937 metres) and Varshambek (3560 metres).

The geology is exceedingly fragmentary. Lazistan, of simpler build than crumpled Ajaristan, seems to be a fault plane steeply scarped to the Chorokh rift and heading, desk-like, to the sea. Short rivers descend in deep ravines. Andesites, porphyrites, and granitic rocks compose the backbones of the hills. The weathering of basic eruptives, tufts, limestones, and marls has produced a thick and fertile soil held in place by luxuriant vegetation. There are many mineral springs mostly of cold carbonic water.

The eastern curve of the Black Sea between Novorossisk and Sinope outlines that belt of the subtropical Colchian or Pontic climate which has reared the wonderful forests of Abkhasia and Lazia rivalling those in the higher foothills of the Himalaya. The greatest heat and moisture are found between Poti and Trebizond. This town has an annual rainfall of 850 millimetres, Rize 2000 millimetres, Batum 2500 millimetres. The mean temperature for August keeps pretty uniformly to 22 degrees. The maximum in August rarely exceeds 30 degrees.

This climatic belt is narrower or wider according to the lie of the mountains. The Pontic range divides it fairly sharply from the hill steppes of inner Anatolia, whereas the branching valleys of Ajaria favour penetration and gradual transition towards the Armenian highlands. A blue sky rarely interrupts the monotonous drizzle of the "gloomy coast," as Lynch has called it.

Here and there the dry atmosphere of the interior sends out feelers into the lower basins of Ajaristan. Along the Chorokh between Artvin and Ardanuch slopes of coloured marls lie naked while the black pines on the ridges drink from the clouds. On the lower reaches of the river, where the vegetation reminded me of the Inn valley near Innsbruck, the peasants fear drought in May. Föhn winds frequently occur. Tsri, above Artvin, is known for sandstorms.

Coming by steamer from Batum in January 1896 I was forced to land at Sevastopol owing to reports from Odessa that the harbour was frozen. The

Black Sea gets very cold in winter: hence an inversion of spring temperature on the southern shores. Foliage and flower are farther advanced on the higher ground than in the gardens near the water's edge. Another curious phenomenon is the horizontal parting of the weather during August as observed in different years by various travellers, including myself. At a level of about 2800 metres one rises above the clouds into a clear and sunny atmosphere. If we compare the Black Sea with the Bay of Biscay we obtain a fitting parallel to the Pontic region. The Cantabrian chain separates the wet rim of the Asturias (rainfall 1000 to 1600 millimetres) from the deserts of inner Spain. Galicia, then, corresponds to Ajaristan.

Humidity has impressed itself upon the landscape of Lazia by means of glaciation and vegetation. So far we know of three good-sized corrie-glaciers, one in the Karchkhal, the others in the Kachkar. They are not mere snow-fields, and they quite surprise us on such low mountains under these latitudes. Moisture explains them.

The impress left by the Ice Age strikes us still more. The proportions of a glacial Alp around Varshambek yield nothing to what we find in Tirol. Corries at the heads of troughs, long lateral and heavy terminal moraines, numerous lakes scooped out or held by morainic dams, granite bosses polished and grooved, characterize the landscape of the heights. A general impression of freshness makes me think that the last glaciation cannot lie so very far back. Although perhaps a minor one according to Alpine chronology, it has left its imprint all over. It may also be that the period from Günz to Mindel and beyond proceeded more evenly here, thanks to surface relief and climate. I can imagine a condition milder but more lasting than in the Alps, with their strong advances and retreats.

So far nothing is known of foreland glaciation in Lazistan. If ever there were any long glaciers, their lateral moraines have been washed out or covered by forest; and terminal moraines may have been pushed into the sea.

In the Alps the descent of the snow-line owing to a lower annual temperature would not have the same quick and sensational effect as in Lazistan in spite of their greater height and more northerly latitude. In Lazistan the present snow-line runs through the steep rocks of the upper ridges where snow will not cling. Only here and there the bed of a high corrie offers a resting-place for accumulations. The long and shallow troughs fit for the reception of *névé* basins lie just within the limit of summer rains and quick melting. Lift them 1000 feet, or let the temperature drop a few degrees, and they would preserve the snowfalls of autumn, winter, and spring. Within ten years the dwellers on the coast would look upon a range of glittering white throughout the year. Winter conditions testify to the nearness of the critical point. Along the caravan route over the whalebacks of Demir-dagh we pass the graves of travellers and muleteers who perished in snowstorms. And in the deep, warm gorge of the Böyük-dere, as late as the end of August, I found the remains of enormous avalanches still choking the river-bed. For these reasons we may assume that the very considerable and fresh-looking moraines at the mouths of corries and small valleys are due to a glacial revival corresponding to the advance of the Alpine glaciers round about 1855. The Lazistan mountains show "strong reactions."



Hot springs at Otingo in the Karchkhal forests



Phot. L. Kreněk
*"First Glacier" halfway between Varshambek and
Kavron Dagh in a corrie facing north-east*



Mount Karchkhal, Ajaristan

"Copious rainfall and abundant vegetation are characteristic of the northern peripheral mountains of Armenia. In some of the valleys the clouds settle for several months in the year, seldom lifting to disclose a view of the sun. It may often happen that during several weeks, or even months, crests and depressions alike will be shrouded in mist. In summer there is produced the likeness of a succession of forcing houses, the slopes and hollows being covered with a bewildering tangle of trees and creepers and scarcely passable undergrowth. From the branches are festooned the lichens, grey-white streamers like human hair; the crimson stools of a fungus shine out from the gloomy brakes, and the pointed pink petals of the Kolchian crocus clothe each respite of open ground" (Lynch).

In Lazia the Pontic, or Colchian, flora is supreme, and identical with that of the western Caucasus known to so many travellers. This régime fades out near Trebizond, making room for the beginnings of the Mediterranean sway. In the neighbourhood of Trebizond, and still surrounded by Pontic vegetation, Handel-Mazzetti found a Mediterranean enclosure with such typical representatives as the strawberry tree and the stone pine (*P. pinea*). In borderlands like these mutual intrusion creates small local climates. Similar conditions are met with in the Chorokh valley near Artvin, where olive, arbutus, and pine also thrive on the slopes near the river. Higher up we can see the forests, but the sides of the ravine show nothing but "goat scrub," chiefly hornbeam. Perhaps hot winds flowing under pressure (föhn?) dry up the lower section of the ravine.

Long ago forests of stately trees covered the whole of the country. But whoever comes by ship, as nearly every stranger did since the time of Jason, will at first meet with nothing but a jungle of shrubs left behind after the devastation of the woods which proceeded inwards from the settlements on the coast. Once merely an undergrowth or accessory, these thickets now obtrude themselves as a botanical formation of their own. Their height of 15 feet or more, and their semi-tropical exuberance, make them impressive enough to the newcomer. But whoever has seen the virgin forest which they have ousted with the help of man, rather despises them as common usurpers that once crept at the feet of the great.

The rhododendron (*R. ponticum*) dominates everything. In spring it bursts into a revelry of pink, here and there spotted with the yellow bloom of the azalea (*R. flavum*). The latter does not assemble in big colonies unless it has found a patch of drier ground more suited to it. Handel-Mazzetti reminds us of the great vertical reach of the rhododendrons from the sea to the timberline, or 2000 metres in all. *R. caucasicum*, *R. smirnowi*, *R. ungerii*, and others prefer aristocratic isolation in scattered places.

Tournefort says there is a rhododendron about Trebizond the flowers of which the bees are fond of, but if anybody eats the honey he becomes mad. This refers to Pliny's aegolethron, or giddy-honey, also mentioned by Xenophon. Hooker says something about the spring honey of the wild bees of East Nepal being rendered noxious by collection from rhododendron. Some writers believe in the rhododendron theory, others suspect the nectar from bay-laurel and henbane; while the scoffers are sure that the honey was simply spoilt by fermentation.

The higher we climb the more the rhododendron predominates. On the lower slopes it is joined by hazel, giant blueberry (*Vaccinium arctostaphylos*), blackberry, bay-laurel, box, cotoneaster, citrus, fig-tree, viburnum, rhus, privet, jasmine, chaste tree, palinurus, Colchian ivy, clematis, smilax, and big ferns (*Struthopteris*, *Pteris*). Among the many flowering plants some strike us by their enormous size. Acanthus, aconite, dead-nettle, larkspur, bur, and scabious will grow 6, 8, and sometimes 10 feet high. Above the timber-line we greet the familiar Alpines. The pastures are studded with *Sternbergia colchicifolia*, which mimics a yellow crocus and which is capable of flowering underground.

Fields and gardens with their maize, hemp, cucumber, tobacco, vines, and fruit trees remind us of the southern Alps, Italy, and the Balkans. The juicy laurel-cherry looks better than it tastes. The hazel nut, fat and sweet, has gained economic importance thanks to the ever-increasing demand by vegetarians and chocolate factories.

Her virgin forests are the pride of Lazia. They are wonderful, and for their sake I wish I were a poet. The commoner kinds are beech, birch, maple, box, chestnut, holm-oak, oak, Pontic oak, poplar, elm, lime, yew, alder, elder, willow, and fir, either the same as our own European or their local varieties. Between 1200 and 1400 metres the deciduous trees begin to merge into the pine woods, which reach up to 2000 or 2100 metres. Most conspicuous in number and size are the beech (*Fagus orientalis*) and Nordmann's silver fir (*Abies nordmanniana*). One cannot fail to be struck by the columnar shape of the beeches. From a distance they often resemble the poplar or cyprus. Nordmann's fir also rears magnificent pillars of even width with a blunted top. Its shape is almost exactly that of the common fir-cone. Now and again a big tree towers lonely above the lower thickets. It may have been spared by the axe, or it may be one of the rare cases where a seedling managed to fight its way through the murk of the rhododendrons.

I feel absolutely sure that these virgin forests of Lazistan and Ajaristan are relics of the Ice Age. Like moraines or glacial lakes they cannot remake themselves without the help of man once they have been destroyed by man. A forester must rebuild the woods just as the engineer rebuilds a moraine when he raises a dam to hold a lake for water power. Once this forest has been cut down it will not grow again—a clear case of upsetting the balance of Nature. The reason is not far to seek when we crawl into the rhododendrons. Nothing can hope to live there with the exception of toad-stools and pale parasites. But how did the trees get here at first if they did not spring from copses as ours do? To begin with, an English copse is a sunny park compared with a rhododendron jungle.

The explanation is that the trees were there before their undergrowth: that this, in fact, crept in under them so that they never grew out of it. When the glaciers retired to their upper lairs they were followed by plants settling on the ground made free. First came the Alpine plants, and after them hardy nordic trees like the fir, the birch, and the beech. The rear was made up by softer tribes like the rhododendrons. As the climate became warmer these climbed higher and pushed themselves under the big trees which meanwhile had gained a firm footing. The forest was already there and thus able to hold its ground.



Central group of the Karchkhals with corrie glacier



Phot. L. Krenek
Glacier in the south-east basin of Kavron Dagh; looking towards Varshambek



Tower near Atina: probably of Genoese origin



Georgian bridge near Tsinati in the Karchkhal Mountains

Therein lies the secret. The high trees keep the undergrowth within bounds, thereby securing some breathing space for their seedlings. If you cut them down the usurpers prevail. We have helped them to strangle the children. The reclamation of the ground thus lost is quite another story. Some one will have to uproot and keep down the suffocating carpet. Typical undergrowth thrives best in the shade, it is true. But here under Pontic skies it need not fear the sun, which seldom shines with full force. Outside the forest it forms a roof of closely packed leaves which prevents floating seeds from reaching the earth. The chances of a sapling are smaller still. In colder or drier countries bad forestry threatens the hillsides with denudation that leaves them the playground of torrents and mud avalanches. Here the danger is "overbushing." Handel-Mazzetti, the botanist and traveller, agrees with me there.

The animals of Lazia are the same as those of the western Caucasus. Red deer and roe deer haunt the woods. Bears and wild pigs, the despair of homesteaders in the forest, devastate the maize fields. Wolf, fox, lynx, wild cat, and marten roam unmolested. In the bazar at Rize I saw many skins of the badger. Otters grow fat on the trout of the mountain streams. A few ibex (*Capra aegagrus*) may survive on the rocky heights. The chances of discovering a last refuge of the European bison are unfortunately small, owing to the narrowness of the country.

Kites, hawks, eagles, and vultures of several kinds are plentiful. In the Karchkhal mountains I saw many Laemmergeier, and even found a ledge where they nest, well hidden in a gorge, but easily accessible. Falcons are trained for hunting the quails when they pass through in the autumn. From among the tribe of small birds let me mention the siskin, bulfinch, pipit, titmouse, wagtail, lark, fire-crested wren, hedge-sparrow, corn-wren, nut-hatch, starling, swallow, martin, swift, thrush, butcher bird, shrike, dipper, yellow-hammer, ortolan, warbler. Game birds are represented by blackcock, moorhen, quail, partridge, and of course the pheasant. Needless to say, the names of familiar birds and beasts often cover particular species.

About the people Lynch says: "Between Trebizond and the Russian fortress Batum along the coast, first the Lazis and then the Ajars may perhaps be regarded as transitional factors to the new order which commences after you have left Batum [*i.e.* by train for Kutais]. I should not venture to pronounce upon the racial connections of the Lazis; they may represent the aboriginal occupants of their country, the wild tribes who harassed the army of Xenophon and were the settled plague of the Byzantine governors and of the emperors of the Comnenian line. The Ajars would appear to be of mixed parentage; like the Lazis they profess the Mohammedan faith."

Apart from the Byzantine longshore rabble whom the tourist calls Turks, and certain ethnic oases, Lazia may now be almost completely "national." The Greeks and Armenians who formerly loomed large in the census have been spirited away except where they continue a camouflaged existence. The Ajars belong to the Gurian division of the Mingrelians. From the rest of the Gurians they distinguish themselves only by their Muhammedan religion and the habits acquired under Islam. The Lazis, also converted Georgians, may be grouped closely with them. Their language leaves not the slightest doubt about their being Mingrelians. The Ajars wear (or wore) Gurian costume,

while the Lazis, with their white head-cloths, remind one more of the Mingrelians of the Caucasus. Native costume is being quickly replaced by European nondescript wearing apparel. The sports cap is a great favourite because it can be turned round for prayers, the peak then being out of the way.

As a seafaring people occupying the coast the Lazis have probably remained in closer touch with the Mingrelians of the Rion valley. Together with them they represent the ancient Colchians. The Turks call them Kadzaro (Khazars). Kadzaria was the Georgian title for Mingrelia. Between Batum and Khopa Ajar settlement comes down to the seaboard. Isolated villages of Georgians or Lazis are found beyond Trebizond as far as Istanbul. I have heard it said that the Armenians of Artvin were not real Armenians, but Georgians converted to the Armenian Church. It may have been a loophole from Islamization. Perhaps Artvin as a trading city was a sort of free town where strangers and non-Christians were left unmolested.

All the Karthli languages can be rendered in the Georgian alphabet. The language of the Georgian Bible and of Rustaveli, the national epos, is common to all the peoples, tribes, and clans. Whoever has travelled in the Caucasus will at once feel at home when on the maps of Ajaristan and Lazistan he reads names like Chukuleti, Mtatskharo, Imera, Marmapati, Shigniti, Khopuri, Ardzhvani, Orjokhokhi, Otkha, Khevi. The Ispir, Janik, Tortum of the Turks are known to the Lazis as Is-pira, Janeti, Tortomi. Mixed up with these we find unmistakable Turkish words like dagh, demir, dere, su, burun, kara, yaila, kümrük, büyük. The Greeks, restricted to the seashore, have left Ophis, Pyxrus, Asferos, Pyxites, Arkhabis, Cissa, Bathys, and that sonorous mouthful, Kalopotamos. So it comes about that the ports and mouths of rivers have three names—Greek, Turkish, and Lazi. Fortunately for the map-maker there is the blank sea to write them on. The Russian language is widely known. Before the War many Lazis earned their living and saved a fortune in Russia as artisans and, above all, as Turkish bakers. Whoever knows Russian can travel without an interpreter. On the roads or in the mountain villages I always found some one of whom I could ask questions in Russian.

Like all the mountain tribes and lovers of liberty the Lazis enjoy a very bad reputation with the ruling classes. According to a Turkish saying the goose is the lowest of animals and the Lazi the lowest of men. I have found them very poor, very hospitable, and, above all, very intelligent. You may meet shepherds who speak English, probably picked up at Roberts College or one of its branches.

Numbers are very uncertain. Velednitsi estimated at 700,000 the number of Georgians on Turkish territory. The Turkish census of 1881 gave roughly 400,000 in the sanjaks of Lazistan, Giumiush-khane, Janik, Trebizond, and Baiburt, after deducting about 100,000 Greeks, Armenians, and others. Only men were counted by the Turks.

The style of building in the towns and especially along the coast is what one would call Turkish. The Ajar and Lazi houses in the country are illustrated opposite p. 476. The wooden chalets on the high pastures of Ajaristan bear a remarkable likeness to those of the Alps. The Lazis are great bridge-builders, continuing the old Georgian traditions. In the course of a short journey I have

crossed at least fifty camel-back bridges, some very old, some newer, and some still in the hands of the masons. Ajaristan, shut off from the outer world, seems to have fallen into Turkish apathy as it was before the War. There one finds only old Georgian bridges. Besides them there are many ruins of castles, churches, and chapels. There is a fine church in the Parkhal valley, built in 931 by King Alexander of Georgia. The inhabitants of this valley favour ridge-settlements resembling those of Tibet and other districts of inner Asia.

Lazia furnishes the typical example of a country whose foreign trade is entirely an overseas trade. The land at the back became too narrow and the harbours became too shallow when ships and cargoes grew in size. Her own commerce has dwindled to a coasting trade in sailing boats with auxiliary motors. If to-day the regular steamers from Istanbul call at Rize we ascribe that to the Ghazi's efforts at strengthening the bonds of the new Turkish state. The service encourages the Lazis.

Her inefficiency in seaborne trade and her isolation from overland trade explain the modern unimportance of Lazia which lies in a quiet backwater of the Near East, a curious patch of country which I call the "Traffic Shadow of Ararat." It is as if the big mountain had thrown out a fan or shoot-cone of obstacles. The roads from Trebizond to Persia and from Batum to Baku circumvent the triangle, whose base is the coast between Trebizond and Batum and whose apex is Ararat. Only the railway from Tiflis to Erzerum cuts it near the apex. In the space between Kars and the sea mule-paths zigzag up and down through a jumble of hills. A few short carriage roads, now probably dilapidated, owed their existence to Russian administrative and strategical considerations in Ajaristan. The Chorokh river is unnavigable save for the rakish barges (*kayuks*) plying perilously between Artvin and Kapandibi, near Batum.

Here then is a landscape where mountaineers on foot were able to maintain their independence and unity, at least to a very considerable degree. The people could easily hide themselves and their property in the woods. The looting soldier drew a blank. No concentrated booty like gold tempted the adventurer; and there was no natural wealth of the right kind or quantity to compensate pioneers for hardship and investment. True, there were always the forests. Fortunately the rivers, short, steep and shallow, are useless for the floating of big timber. At Istanbul boards from Canada are probably cheaper than those cut by hand in the mountains of Lazistan, not to speak of Russian dumping. Timber for local building is carried down on horseback. Nor is there much demand at present owing to the many empty houses left behind by the Greeks and Armenians. Only small beech logs for fuel are being floated down to the towns on the coast. The time for exploitation will come. But let us hope that by then the Turkish Government will have created a forestry department for the intelligent nursing of this great wealth which in fifty years may mean hundreds of millions to the nation.

After a day's march through cultivated country and the rhododendron jungle we step under the vaults of the big trees and onward to the top of the range. Only transverse mule-tracks across high passes connect the seashore with the Chorokh valley and the Erzerum road. From the ridge we look southwards over an expanse that is sunnier, drier, and almost treeless. But the natural

contrast cannot always have been so sharp, for the clouds do not unload all their water on this side. Something must have accentuated the parting.

Beyond stretches the historic country with big cities, the centres of a big demand that had to be satisfied. And it was satisfied by raking in everything within reach, whereas neither Russia nor Constantinople had need to draw upon supplies from Lazistan. A high mountain chain fences her off from the stronger market. The devastators laid the country bare all around them until height added to distance bade them halt at the devastation-divide. They left the southern slopes grim and naked, rutted and strewn with scree, for rhododendron does not thrive in the sun nor in the frost of clear nights. No green carpet covers the sins of man. It was now cheaper to cart wood from Trebizond or elsewhere by easy main roads however long. Finally even charcoal did not pay, and the Armenians got accustomed to warming their bodies or cooking their dinners over a fire of dung. Man has accentuated the lines of nature. The watershed, the parting of the weathers, and the forest-divide fall in with an economic divide.)

Lazia as yet means little on the markets of the world. Hazel nuts represent her only export in bulk. Thirty years ago an English company started copper mining on an ambitious scale at Kvarstkhana on the Chorokh below Artvin. After the War the Germans took over and built a road to Khopa. The enterprise has collapsed, I am told. Maize forms the staple diet. Wheat, barley, rye, vegetables, fruit, and tobacco barely suffice for the needs of the population. One sees a fair number of cattle on the upper pastures, but breeding and dairying could be vastly improved. Boxwood, once much in demand for woodcuts, goes to Erzerum, where it is made into combs for the harems of the East.

Agriculture can be developed on this fertile soil, and it will be, since Russia is no longer open to emigrants. Under the new government the Lazis, intelligent as they are, should be able to make headway at home, for theirs ought to be a country of peasants and stock-farmers comfortably off. Under the sultans of days gone by the landowner, who cannot hide or shift his capital, was the everlasting prey of the tax collector. The age of the rich middleman is passing; hard work will be the order of the new world. A grateful soil rewards the toiler in Lazistan. Here milk and honey can be made to flow.

Neither drift nor dream carried the curious into the wilds of Lazia. On the whole travelling Europeans followed trade. Old explorers like Marco Polo pushed along the caravan routes. And only after the tourist has come in the wake of the traveller does a country gain real prominence in popular knowledge. Explorers with their eye upon the Caucasus, Turkistan, Persia, or India were deflected from Lazia by the roads to Baku or Erzerum. Lazistan did not become a field of enterprise until young Germans had painfully searched the map for small white spots within the radius of action prescribed by the motive power of their purse. In the early forties of last century Lazistan was visited by Karl Koch, who crossed the Pontic range three times. After that we hear practically nothing for eighty years. Then began what is almost a rush. In 1925 Professor Stratil-Sauer studied economic conditions. He was followed by a young student, G. Fochler-Hauke (Khopa-Ardanuch 1926; Demir-dagh 1930). In 1930 the Brecht-Bergen Scouts climbed Varshambek and allowed me to join



Camp on the lake at the foot of Varshambek



Looking south-west from summit of Varshambek across Varshambek pass



Looking south-west from Point 3290 metres, near "First Glacier"

them in a repetition in 1932. They are preparing a third trip for this summer (1934). In 1931 Ludwig Krenek of Vienna and his friends carried through a remarkable ridge-walk, pushing on beyond Kavron-dagh and climbing ten summits. During the summer of 1933 the brothers Leutelt of Innsbruck visited the Pontic range for scientific study. At the same time two groups of tourists from Vienna, under Karl Haltmar and Fritz Köberle, were busy on Kavron-dagh and Mesovith-dagh.

Meanwhile Ajaristan is being neglected, although I have been wanting to go there these ten years. The approaches are too long now for people who cannot afford the cost of transport. Formerly it was easy enough to enter from Batum by the Chorokh valley. Nor did Ajaristan receive very much attention during the Russian occupation. Its share in geographical literature is infinitesimal compared with the space devoted to the Great Caucasus and the rest of Transcaucasia. J. Mourier, Consul Peacock, Radde, the Countess Uvarova, and myself were among the few who travelled here. Besides Peacock and myself we read of none who strayed far from the roads aspiring towards the peaks. Peacock, who had been British Consul at Batum, was no longer alive when I made my first journey. When friends told me about his trip to Karchkhal I wrote to his widow, a daughter of Bakunin. She replied that her late husband had climbed the mountain but that his diaries had been destroyed by fire.

My first journey in 1894 took me through Transcaucasia. I travelled from Batum to Kars, visited Ani, climbed Ararat, and returned to Tiflis. At Batum I picked up Grigor Makandarov, the dragoman, who later accompanied my wife and me on so many journeys to Suanetia and Turkistan. I had the pleasure of seeing the old man still alive in 1932. The usual quadriga, a victoria with four horses abreast, took us along the narrow carriage road to Artvin. Before getting there we spent the night at Sinkot in one of those Russian forwarding prisons for chain gangs. To call it empty would be an insult to the bugs. Next morning we rode through those never-to-be-forgotten forests to some shepherds' huts, and thence at dawn scrambled up to the south-easternmost peak of Karchkhal. I called it Artvin peak because it overlooks that town. On the top we found a cairn, probably Peacock's, for natives do not waste energy on such monuments. Back to Sinkot and on to Artvin, where the carriage was dismissed. Here Prince Eristov, the Governor, bade us linger. We spent two days in his hospitable house. Alas, where are they now, the princes and the Eristovs? They had their faults: but they were romantic tyrants.

Artvin in 1894 was a picturesque town of 6000 inhabitants, mostly Armenians, of whom I have already spoken. Town and district, including the sections of Artvin, Ardanuch, Shavskhe, and Imerkhevi with 53,000 souls, were called Livana by the Turks. Hundreds of houses were ranged in tiers upon the hillside. By twenty-four turns the road winds steeply down to the river (180 metres), and then by as many again climbs to the market-place (630 metres). The size of the town can be explained only by its situation on the road from Kars, which may have been important before the Russians pacified Transcaucasia and built the railway. Dyes were made here, and Artvin Red enjoyed a considerable reputation.

From Artvin we took horse to Ardanuch, with its old fortress, its canyons, and its caves. Beyond Ardanuch the forests begin to thin out. They have ceased altogether when one has crossed over the Yalanuz-chamski pass into the hill steppes of Ardahan. Here the local bumble, a general, caught me for a spy and sent us on to Kars, where we spent a week in durance vile.

In the following year, 1895, I returned with my friend Dr. Hacker. From Borchkha on the Chorokh we entered the ravine of the Devis-tskhali and past the villages of Tsinati, Devskhel, Kvintaur, and Bagin pushed on to the hot springs of Otingo, the local spa in the densest middle of primeval forests. This we made our headquarters, but spent most of our time on the yaylas or in high camps. We climbed nearly all the peaks, including the highest (Batum peak, about 3800 metres).

The most interesting feature of the Karchkhal group is a considerable glacier—considerable for these parts—descending from the precipices of the big eastern corrie. It is a real glacier as shown by deep crevasses and terminal moraines with a green lake embedded in them. The slaty rocks of Karchkhal may explain the rarity of lakes which abound in the granites around Varshambek. Sculpture in granite lasts better. Compare Scotland, the High Tatra, parts of the Rila mountains in Bulgaria, and others.

Four years after leading the great Pamir Expedition of 1928 I got terribly restless again. Lack of money suggested adaptation to the spirit and the methods of the times. Having passed my test, simplicity, discipline, comradeship, I was allowed to join a hiking party arranged by Brecht-Bergen's Scouts. For the modest sum of twenty pounds a head we completed, in six weeks, the round from Berlin to Vienna—Budapest—Belgrade—Sofia—Istanbul—Lazistan—Batum—Odessa—Poland, and back to Berlin. It meant third class, deck passages, and carrying loads; it meant duty all the time, fatigue duty, kitchen duty, and night watches. The trip through Lazistan was necessarily short and hurried. But I was glad to revive old memories of Ajaristan, the sister country. Professor Brecht-Bergen himself, the toughest of old scouts, led the expedition.

Our party of eleven marched out of Rize on August 17 and entered the Asferos valley by crossing a spur. It rained, needless to say. Nor did it matter, for perspiration was just as wet. The cultivated countryside reminds one of south Tyrol. It conforms with that widespread type which one might call the Mediterranean hill garden where red-roofed houses peep over maize fields and out of trees festooned with vines. We follow the petroleum track. Petroleum in tins from Batum travels by mule to Ispir. The road is paved, neatly at first, more roughly where it leaves the populated districts. This pavement is necessary because without it man and beast would stick fast in the wet clay or drown in the mire. On the top of the small pass stands an octagonal well-house. From its roof hangs a charm, a wooden hoop with gaudy rags and eggshells. It reminded me of the rag-trees of Turkistan to which passers-by tie shreds from their garments.

Along the Asferos one does not easily distinguish between the road and the pebbly river-bed. At Ambarlyk we camped and pondered the problem of getting dry. It proved insoluble. A camp fire was out of the question. It would take hours to cut down enough of the dripping rhododendron; and one would



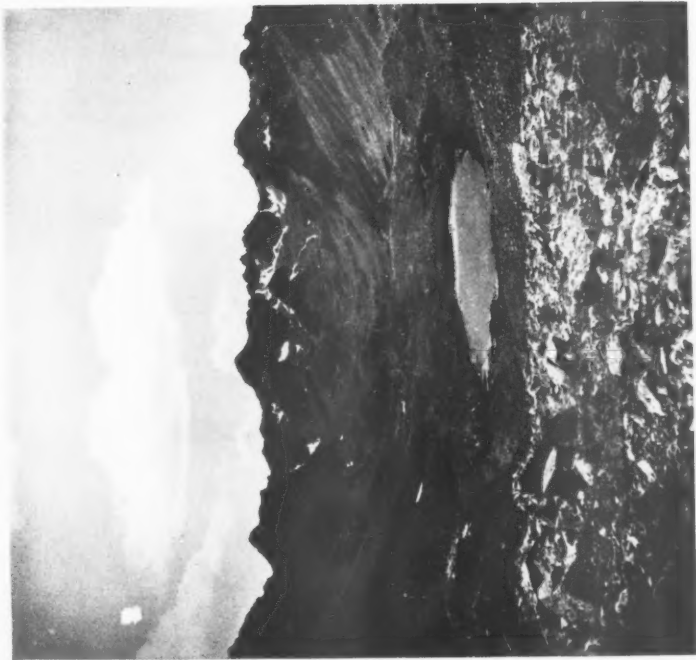
Hemshin .



Peasant's house in Ajaristan



Looking over old terminal moraines and glacial trough of Varshambek corrie towards Hemshin



Looking south from Varshambek pass

simply get drenched. We used our primus stoves nearly all the time. On the clear heights there was no wood, and in the woods everything was wet.

Soon after Ambarlyk the path climbs steeply uphill to the Han Memish Pasha through a jungle of rhododendron and alder bushes. There is a general tendency to gain harder and drier ground above the timber-line. From the Han, a smoky den, the mule-track winds up for another 1000 feet or so through a glorified Virginia Waters. If you do not shirk the shower bath you may elbow your way into the thickets to gather blueberries from the tall vaccinium bushes. Under a rock we saw wayside offerings of rags. Here the dry places are as rare as the trees in the hills of Turkistan. There is no pavement because we are supposed to walk on rock. But marl is a soft rock into which the feet of countless mules have worn deep trenches. These the animals use until the loads begin to scrape against the sides. Then they choose a new line. They seem to judge to a nicety how much margin is left.

At 2000 metres we sniffed the Alpine air and walked for two days through mist over the whaleback ridge of Demir-dagh. It is a wonderful track, and with a view would be still more so. We passed the rough shelter of Charankaya. At Kurtere volcanic sherds covered the ground. We camped on the pass of Demir-dagh (2800 metres) below the top of the mighty hill (3100 metres). The clouds began to settle, and next day we saw the mountains tower above basins of cream. Due east of us and a little to the south of Demir-dagh we espied the rocky pyramid of Varshambek, our goal. We bade farewell to the caravans and started on a most exhilarating high-level traverse along the flanks and shoulders of rounded hills until the granite ribs of sterner peaks pointed down to the mists shrouding the pastures of Tsörmäliman strewn with glacial boulders.

From here a short climb leads to the pass (2900 metres) overlooking the wide dish-like hollow of the Hemshin yaila, and the sources of the Böyük-dere river. With its moraines, lakes, and planed rocks it is the very epitome of the Ice Age. We crossed this in an easterly direction towards a waterfall marking the entrance of a valley below the cliffs of Varshambek. This valley rises in three steps, each with a lake, to a high pass (about 3000 metres) which is used by the natives as a short cut from Atina and Hemshin to the Chorokh. We met some people carrying boxwood to Ispir. It must be a regular route, for a good deal of road-making has been done to render the cataracts of granite passable for beasts of burden. Here we stayed for three days by the borders of the lower lake enjoying fine weather all the time. There was no rain, and the mists rising at night stopped just short of us (about 2800 metres). Our young people climbed Varshambek while I risked my neck chasing Apollos on precarious ledges.

I also watched the dragon-flies. Thousands of them whirred over the northern buttress of Varshambek, coming from the west, and then flew southwards over the pass. None came back. They were either circling the peak, on pleasure bent, or they were leaving to end their days peacefully in the sunny south. The mountain lakes may be their breeding grounds. Perhaps they had been warned of the oncoming cold. During our last night (August 26) we had a hard frost. All shallow water was turned into solid ice. To the people of Hemshin, Varshambek (3560 metres) is a sort of holy mountain of fable and

mystery. Kavron-dagh to the east (3937 metres) has been climbed by Ludwig Krenek, who also discovered the glacier there. For this, the highest part of the Pontic range, the maps show many names: Parkhal, Balkhar, Paryadres, Kachkar-dagh. I have chosen the latter as the best.

Descending the great U-valley we passed the miserable stone huts of Sogorni (2300 metres), a summer village (alp, yaila). Why do these people not take the trouble to make themselves a little more comfortable by building wooden chalets? The forest is only a few hours away. The Tyrolese had often to go much farther for their timber.

Hemshin (2100 metres), with houses stepping on the roofs of those below, is seen from afar on the left slope of a tributary valley which we join at right angles. A permanent hamlet, it lies just on the border-level between tillage and pasturage. Fields of rye and barley make a curious sight in the cool expanse of Alpine pasture. Probably the mist protects the crops from radiation. This would agree with the Hemshin saying that the Lazi sees the moon oftener than the sun. I take this to mean that he sees both very rarely, for the dangerous clear night would spoil my theory. Clear nights are however more likely in winter. Anyway, this needs investigation. A meteorological traverse of the Pontic range with three stations (coast, top, Chorokh) should yield valuable results.

The trough now contracts sharply into a V-cleft. On the steep banks grow the regular candelabra of *Eryngium giganteum*, a grey bloom on the hard, prickly leaves. Soon we dive into the luxuriant forests of the Böyük-dere, through which we march for two days along a paved road, often meeting trains of laden mules. On the knob of a rocky corner stands an old castle of simple architecture but well preserved. That it guarded an important highway seems sufficiently clear. But when? In the remote Georgian days? Or could the Greeks possibly have pushed an outpost so far up-river? Then there are the Comnenian days to consider. Lazistan is full of such puzzles.

We passed many fresh clearings with new houses and very large steep fields to which maize clings with stilted roots. The houses are too fine for homesteaders making a start. So evidently we have to do with people retiring on a competence. It does one good to find a country where the slogan "Back to the land!" is obeyed naturally. These settlers have to keep up a running fight with bears and pigs. One device consists of bells made of empty petroleum tins and connected with the bedroom by strings. Every time the master of the house turns round in his sleep he gives a pull at the bell-rope. At the most dangerous time, when the crops are ripening, the whole family have to watch through the night on wooden platforms, where they nurse fires on hearths of clay. In the dark one sees these lights twinkling on the mountain side. Bees are kept here, as in Ajaristan, in hollowed sections of tree-trunks. They are placed out of reach of the bears on steep cliffs or between the upper forks of smooth beeches.

Finally the path climbs over the divide into the valley of the Atina-su. Our last stage was through the typical low-lying Colchian landscape, swampy in parts, full of creepers, exuberant and malarial. At Atina we embarked in a feluca for Batum, veritable Argonauts.

DISCUSSION

Before the paper the PRESIDENT (Major-General Sir PERCY COX) said: The paper to-night is, as you are aware, on Ajaristan and Lazistan. The lecturer, Dr. Rickmers Rickmers, is a traveller of forty years' experience. He has a magnificent record as an explorer and traveller, and is well known to us in this Society, so I need not go through the long list of his achievements. But there are one or two which I should like to bring to your memory.

He started his exploring activities in 1894—forty years ago—when he went on an expedition to Transcaucasia and Bukhara; he undertook further travels in 1895 and 1896, and in 1898, after a journey in Eastern Bukhara, he wrote a paper in the *Geographical Journal* of 1889 entitled "Travels in Bokhara." In 1906 he journeyed to Russian Turkistan and wrote a valuable book in 1913, the title of which was 'The Duáb of Turkestan.' In 1913 he travelled again, and in 1928 he took on his greatest task, namely, the organization and management of the Russo-German Expedition to the Alai-Pamirs of Central Asia. On his return from that expedition he read us a paper in 1929. In 1932 he travelled again in Ajaristan and Lazistan, a small section of coast now in Turkey's limits between Batum and Trebizond and its hinterland: a region of which we have heard very little for a long time past, but which, as you will see, is of great interest.

I am glad to tell you that we have with us this evening the Turkish Ambassador, H.E. Ali Fethi Bey, whom I had the honour to meet in Constantinople ten years ago, when we were representing our respective countries. It is a great pleasure to welcome him and his charming lady here in London.

I call upon Mr. Rickmers to read his paper.

Mr. Rickmers then read the paper printed above, and a discussion followed.

The PRESIDENT: Your Excellency, will you do us the honour of addressing us for a few moments?

H.E. ALI FETHI BEY: Mr. Chairman, Mesdames, Messieurs, Je suis profondément touché des aimables paroles que Sir Percy Cox vient de prononcer à mon sujet. J'ai eu l'honneur de le connaître il y a douze ans à l'occasion de notre collaboration sur une question litigieuse, et d'apprécier toute la noblesse de caractère de ce parfait gentleman. Je remercie également de tout cœur le Dr. Rickmers pour ses paroles si bienveillantes sur mon pays et pour son désir de faire connaître aux Membres de la Royal Geographical Society les beautés naturelles d'une région de la Turquie où il a voyagé. Je puis dire que, au moins en ce qui concerne cette partie de mon pays, les connaissances géographiques du Dr. Rickmers sont bien supérieures aux miennes et que sa conférence m'a appris bien des choses intéressantes. J'ai éprouvé un grand plaisir à entendre décrire les beautés de la Turquie devant un auditoire si distingué, et je remercie au nom de mon pays comme en mon propre nom toutes les personnes présentes de l'accueil si cordial et si chaleureux qu'elles ont bien voulu me réserver.

The PRESIDENT: I am afraid Fellows of our Society who have travelled in that part of the world are few, and I cannot help expressing sincere regret that our "grand old man," the late Mr. Douglas Freshfield, is no longer with us, for he would have been exceedingly interested in the lecture we have just heard. I will ask Dr. Longstaff, who travelled in that region some years ago, to address a few words to us. He is an old friend of the lecturer, who is a fellow-member of his in the Alpine Club.

Dr. T. G. LONGSTAFF: This is the third paper read here by my old friend that I recollect hearing. He began by some rather facetious remarks as to my youth;

so I will begin by reminding him that his grandfather, who was a great friend of mine, was a member of that well-known Heligoland family of Rickmers which has since attained renown in the Bremen shipping world, and therefore Rickmers is by descent a Britisher. I remember the time he speaks of, when we met in the Alps and his frequent visits to this country, where he found a wife.

In 1903 I went to the Caucasus, climbing in Suanetia with Rolleston. There Rickmers, leading a fine team of Bavarians, showed us the greatest kindness, though we were in open competition with him.

I have been at Trebizond and I have seen the Lazistan mountains from the sea, but I have not visited the country. I would call your attention to the very remarkable and little-known fact that in Lazistan and also in Ajaristan, but in Lazistan particularly, there is the nearest virgin "Himalayan" forest that is left in existence. Once virgin forest has been destroyed it is never the same. There are great efforts nowadays being made practically all over Europe at reforestation. We suffer a good deal in the New Forest from efforts at reforestation. But it is a remarkable thing that it is, apparently, impossible to reconstitute a similar forest once it is destroyed. I want next to point out how Himalayan those forests are. You start with the tropical rain belt of vegetation which is very like the vegetation of the foothills of the Himalaya; you then go up through the oak, the Lazistan oak which is reminiscent of the Khargu oak seen in the middle hills on the way up into the true Himalayan region. Beyond that you come to the fir, the pine, and beyond that to the rhododendron. We think generally of the rhododendron as of Himalayan type, but really, of course, the Caucasus, in which I include Lazistan, is for us Europeans the home of the rhododendron. All these trees you see in this country easily accessible from the Black Sea, and now, under Turkish sovereignty and administration, far safer than when Rickmers, Rolleston, and I were climbing in Suanetia and the Caucasus. The flora is the same in the Caucasus as in Lazistan, and the lupins and larkspurs grow to an enormous height. When you are riding on horseback the flowers are up level with your head. It is a most fascinating and interesting country, very easily accessible and requiring no special permits, requiring no escorts nor anything of that sort. But travelling is distinctly roughish.

Which brings me to what I wish finally to make a point of saying this evening. Here has Rickmers been climbing, exploring, leading great expeditions, making maps for over forty years; and now circumstances for him in his country are not so fortunate as they used to be. Times are much more difficult. Now when he is, shall we say, approaching my mature age, you see he goes off with a party of hikers to Lazistan. He does his bit in the way of cooking and looking after camp. He comes here and he pretends to us that he does it for scientific reasons, and he *has* brought back new facts concerning the recent glaciation of three countries. But I know him better; and that is why I like him so. He is so very young. He simply does it because he likes it and won't give it up whatever hardships and discomforts he has to put up with.

The PRESIDENT: I expect many of you know that Dr. Longstaff himself is off in a few days, not "hiking" to Lazistan, but on an expedition to Arctic Canada. Like Dr. Rickmers, he snaps his fingers at *anno domini*.

I do not know if any member of the audience has had experience of the region about which we have heard? Apparently not, so it only remains for me to wind up our proceedings. We have listened to an extraordinarily entertaining and instructive lecture and one abounding in dry humour. Dr. Rickmers has portrayed to us a very unfamiliar piece of country, quite unlike anything we have had on the screen for a long time past. I ask you to join me in thanking him exceedingly for the pleasure he has given us by his lecture to-night.

A RUINED NESTORIAN CITY IN INNER MONGOLIA

OWEN LATTIMORE

THE Ongut or Onggot tribe,¹ a Nestorian Christian people to the north-west of Peiping, mentioned by both Marco Polo and John of Montecorvino² in the thirteenth century, offer one of the most important minor problems of Central Asian and Mongol history, and of the history of the Great Wall frontier of China. It may be that new light can be thrown on this problem by the discovery of a ruined city, containing Nestorian relics, a few miles east of the great Mongol lama monastery commonly called Pailingmiao. This temple stands about 100 miles north-west of Kweihwa, in the province of Suiyüan, and is therefore near the northern fringe of the territory that has long been known as the domain of the Ongut tribe. In this territory, and probably in the southern part of it, near the modern Kweihwa, stood the city which Marco Polo called Tenduc; and from it came the "prince George" whom John of Montecorvino converted from the Nestorian heresy.

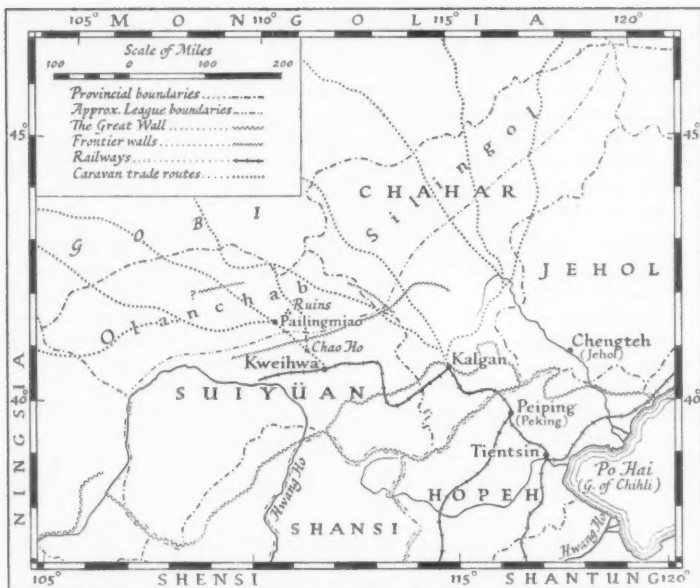
The ruined city which I came upon in 1932 lies in the famous grazing grounds of Pailingmiao and close to the most frequented east-and-west route between the Mongol regions north of Kweihwa and those north of Kalgan. The country has been traversed repeatedly by recent travellers, and it is therefore by pure accident that the city has not previously been noticed. In my own case, I actually heard of the ruins before visiting them, and went there because of the stories I had heard. It was while travelling with one Mongol companion, with no particular destination in mind, being engaged primarily in studying the Mongol technique of caravan travel, that I began to hear stories of the wife of a Mongol noble, who had been "possessed" by the spirit who was "lord" of the ruined city. The noble in question was the Jön (written form, Jegun) Beise, or East Beise of Khalkha Right Wing Banner, who had taken bricks from the ruined city to build himself a "palace" a few miles away. I give the story in its fullest version, one which I heard some time later:

The Jön Beise, less than a year before my visit, took cart-loads of bricks to build himself a house. Shortly after this, his wife became possessed of a *chitgur*, a demon or spirit. She turned in the night and abused her husband—this being the demon speaking through her mouth—for robbing the ruins. Her husband called lamas and had prayers read to restore her. The *chitgur* was Khureng or Khurum Bator, the Blackavised Hero, servant of Sokhor Liu-tzu Khan, Blind Liu-tzu Khan, the Lord of the ruined city. The contest between Khureng Bator and the lamas was indecisive, so he returned to his master. Then Sokhor Liu-tzu Khan himself became a *chitgur* and entered into the Khatun, the Lady or wife of the Beise, and said, through her mouth,

¹ See Paul Pelliot, "Chrétiens d'Asie centrale et d'Extrême-Orient," *T'oung Pao*, Leyden, 1914. Professor Pelliot traces the Ongut to southern Kansu, prior to their establishment in the Kweihwa region. This may well indicate a Turkic affinity, comparable to that of the Salars of Kansu.

² The most convenient general reference is in Yule's "The Book of Ser Marco Polo," ed. Cordier, 3rd edition, London, 1921.

to the Beise: "I am Sokhor Liu-tzu Khan, Lord of the ruined city. What do you mean by taking bricks from my city? You are a Beise, you think; a great man, a *noyan* or official, and you can do what you like. But you are only a great man of to-day, and perhaps yesterday and perhaps to-morrow. I am the Lord of this city and this land, and have been for over seven hundred years. I have tens of thousands of souls under my rule, and over them are several *chiang-chun* or marshals [a Chinese word, but frequently used by Mongols] and two Heroes; Khureng Bator [also sometimes called Khara Bator, Black Hero]¹ and Chagan Bator, White Hero. [These colours, in a Mongol story, indicate the principles of evil and good respectively, and the dualism, in this particular instance, sounds like a faint Manichaean echo.] The souls of the people of



Position of Nestorian ruins

my city have for hundreds of years been only frogs and snakes; but do you not suppose that they are still souls? Seven hundred years is a long time, and do you not suppose that they want to change? [I surmise that this is a threat to loose all the souls upon the land.] The lamas of Bato Khalakh-in Sume² also took bricks from my city; but first they said prayers. That was all right. A brick is only a brick, and anybody can take a brick. But these bricks of mine are made of no ordinary earth. That earth came from very far away, and is as

¹ Cf. the story of a somewhat similar Khara Bator Djandjyn (i.e. *chiangchun*) connected with the ruins of Khara Khota (Marco Polo's Etsina), by Henning Haslund, in "Mongol," *Journal of the Royal Central Asian Society*, London, July 1934.

² The true Mongol name of Pailingmiao; see below.

precious as silver. [In other words, the "magic" of the bricks should have been taken away by prayer before they were used as ordinary bricks.]" Thus he spoke to the Beise for several nights, in the person of the Beise's Khatun—who, in her proper self, knew nothing about it all. The prayers of the lamas had no effect. At last the Beise invited a *gurteng* or *gurtum* lama: a kind of sorcerer who preserves much of the old primitive shamanism of the Mongols, in a form modified by the Lama-Buddhist Church. The *gurteng* made them clean the whole place and prepare it for a great feast. Then they made ready special food and delicacies, which cost them a great deal, and a valuable present for the *gurteng*. (Such a present is regarded as a present to the spirit itself.) Then they sat down to the feast, and the afflicted Khatun ate a good deal (that was the spirit eating), and afterwards the *gurteng* rose and said to the spirit that he hoped he had enjoyed the feast, and that he must now desire to return to his home; and they wished him well. Then the *chitgur* left the Khatun, and she had not been ghost-possessed since.

The stories of this business had reverberated all through Inner Mongolia—making it, incidentally, much easier to find out other stories about the city. It had been taken so seriously that there was even a proposal that the Panch'en Lama, who was then making a "progress" through Inner Mongolia, should be given a very large public offering and asked to exorcise the frog and snake population of the city, either by prayers enabling them to be born again as higher animals, or as men, or by causing them to remove to some other place. After hearing some of the stories I asked to see the city, and my Mongol companion took me there without any difficulty. All my photographs of the ruins, and my notes of legends and stories, have been put at the disposal of Professor Paul Pelliot, who is by far the most eminent authority on the whole subject, and can best discuss its historical significance. In the following account I shall merely describe the position of the city, give the legends, and say something about the general principles of the historical geography of the region; for the ruined frontier walls and fortified cities of Inner Mongolia, in their relation to the Great Wall of China, are of the highest importance in studying the correspondence between racial and political and physical geography, which for centuries has been extraordinarily close all along this immensely important frontier.

The city of Kweihwa stands in a plain enclosed on the north by the Inner Mongolian plateau and on the south by the mountains of Shansi province. The plain is therefore a kind of tidal reach, into which have flowed alternately Chinese from the south and nomadic peoples from the north, of whom the Mongols were the latest. At times—especially when the nomads were in the ascendant—there has been a tendency to compromise, with Chinese trading towns and farming settlements flourishing under nomad rule. At a distance of only 3 or 4 miles north of Kweihwa the great caravan route, whose branches run to Outer Mongolia, Chinese Turkistan, and the Moslem Pale of Kansu province, enters the frontal hills of the plateau. It crosses a pass called the Wu-kung Pa, a Chinese name translated as Centipede Pass, which may however be a corruption of a Mongol name. The pass is a double one; after reaching the first crest, the road descends abruptly and then makes a long ascent. At the second "crest" there is no further drop; the road leads out on

to the open, rolling Mongolian plateau. The distance from Kweihwa is about 30 miles.

For another 40 or 50 miles north from the rim of the plateau the Mongol pastures have been colonized by Chinese. The front of colonization is not everywhere equally advanced, but is roughly governed by "economic distance" from the railway, for which the maximum, in regions where motor transport has not become important, is about 100 miles. Colonization has advanced farther to the north of Kalgan (reached by the railway in 1909) than it has to the north of Kweihwa (reached by the railway in 1921), owing very largely to the longer operation of the economic stimulus introduced by the railway. In both regions colonization has noticeably receded in recent years, chiefly because of the decline of railway trade, as the result of civil wars, but also because of successive years of drought or cold, and in some regions because of the destruction and blowing away of the topsoil, where land that should never have been brought under cultivation has been "massacred" by the plough. The front of colonization also varies according to local conditions: where watered valleys can be reached, the Chinese farmers tend to penetrate earlier and to adventure farther north.

About 60 miles from Kweihwa by road, on the main caravan route, there is a kind of embayment where the advance of the Chinese has been impeded by the existence of an important Mongol religious foundation, commonly known to the Chinese as Chao Ho or Temple River, and to the Mongols as Shiretu Jo. Mongol lamaseries generally have two names, one being the place-name and one the formal title of the religious foundation. Very frequently there is also a "jargon" name, used by caravan men and Chinese traders who speak a broken Mongol; and this, unfortunately, is the name most likely to be recorded by travellers. Chao Ho is a jargon name, being derived from the Chinese pronunciation, *chao*, of the Mongol, or rather Tibetan, word *jo*, a temple, compounded with the Chinese word *ho*, a river. Shiretu (written form, Siregetu) Jo is the Mongol place-name, meaning Table Temple, or Temple on the Table-land. The word *jo* is a Tibetan loan-word which entered the Mongol language with Lama-Buddhism.¹ This temple domain, only about 10 miles square, is important as being the northernmost Tumet Mongol territory; between it and the Kweihwa plain, almost all of the Tumets have been swept out by Chinese colonization. The Tumets once held all the land from Kweihwa northward to this line. The original trading town of Kweihwa was built at the end of the sixteenth century by a Tumet prince, as his "capital," and received the name of Kweihwa, meaning Return to Civilization, as a kind of compliment from the Chinese, when the Tumets desisted from an attack on Peiping.²

The Tumets have suffered heavily from Chinese colonization, which began to affect the Kweihwa plain in the eighteenth century, under Manchu rule. There are now only a few thousands of the Tumets, most of whom live on

¹ W. W. Rockhill, 'Diary of a Journey through Mongolia and Tibet, 1891-92,' Washington, 1894.

² Owen Lattimore, 'The Mongols of Manchuria,' New York, 1934; with references to the 'Meng-ku Yu-mu Chi,' or 'Record of the Mongol Pastures' (preface dated 1859), and to J. F. Baddeley, 'Russia, Mongolia, China,' London, 1919.

irrigated land at the foot of the plateau escarpment. They live partly in separate villages and partly in mixed villages of Tumets and Chinese, but have lost their language and live like Chinese. Later colonization, stimulated by the railway, affected the Tumets of the plateau even more suddenly and drastically, almost wiping them out. A few hundred of them who yet retain the Mongol language are still scattered through the mountains between plain and plateau; and a few hundred more remain in the Shiretu Jo temple domain. Such temple lands are, by origin, set aside from tribal lands. They are under the ecclesiastical rule of the religious foundation, not under tribal rule, and the lay Mongols living in them are "subjects" not of prince or tribe, but of the Church. There are said to be ruins and even inscribed stones within this temple dome in which may possibly, from the description, be old-Turkish runes. Temple sites in Mongolia may often (like so many Moslem shrines) inherit the sanctity of earlier religions. It is not impossible that there is an ethnic continuity between the Tumet Mongols and the Nestorian Ongut, and that modern sites like Kweihwa and Shiretu Jo may be on, or close to, sites that were important in the thirteenth century. A ruined city called T'o-k'e-t'o, near Kweihwa, has been suggested as the site of the Tenduc of Marco Polo.¹ The name T'o-k'e-t'o or Tokoto is obviously the Chinese corruption of a non-Chinese name.

The temple domain of Shiretu Jo is watered by a small stream flowing toward the mountains, the Kweihwa plain, and the Hwang Ho. Its northern boundary is a watershed, not easily obvious to the eye, but important as the dividing line between Yellow River drainage and the inland drainage of the Mongolian plateau. Here one leaves the almost obliterated territory of the Tumets and enters that of Khalkha Right Wing Banner, popularly known as Darkhan Beile Hoshio, or Banner of the Independent Beile, from the title of honour of its ruling prince. This Banner, as can be seen from its name, is of Outer Mongolian origin. It was founded by Mongols who migrated from Central Outer Mongolia in the seventeenth century, as a result of quarrels between their own princes, and acknowledged Manchu overlordship on entering Inner Mongolia. They form part of the Olanchab (written form, Olaganchab) League of Inner Mongolia, and are thus distinguished from the Tumets both tribally and by political organization; for the Tumets were not included within any of the Leagues of Inner Mongolia, but were placed by the Manchus under a special form of administration, something like that of the Chahar Mongols.

The territory of the Khalkha Right Wing Banner, according to the 'Meng-ku Yu-mu Chi,' or 'Record of the Mongol Pastures,' extends for 120 *li* or about 40 miles from east to west, and for 130 *li* or about 43 miles from north to south. On the north it borders Outer Mongolia, on the east the Durbet Khukhet tribe (or Banner) of Olanchab League, and on the west the Minggan, usually called Mo (written form Mago) Minggan, tribe or Banner, also of Olanchab League. From 10 to 20 per cent. of the Banner territory has been colonized by Chinese, but the Mongols themselves are pastoral and have not, like the majority of the Tumets, taken to agriculture. The frontier between them and the Chinese is therefore an economic and cultural frontier as well as one of

¹ Yule and Cordier, *loc cit.*; also Pelliot, *loc. cit.*

race and language. The Mongols of Olanchab and those of Silingol (the next Inner Mongolian League to the east) have recently started a movement for autonomous self-government, and have demanded guarantees against further Chinese colonization. Olanchab League is nominally a part of the Chinese province of Suiyüan, and Silingol nominally belongs to the province of Chahar; but both of them are bands of pure Mongol territory lying in the north of the Chinese provinces. In practice, the hereditary Mongol princes send representatives down to the Chinese provincial capitals to represent them in negotiation over Mongol affairs. No Chinese officials enter the Mongol territory to administer or rule the Mongols, and Chinese control is therefore measured in practice by the rate of Chinese encroachment through colonization, which drives out the Mongols and replaces them with Chinese.

Between 30 and 40 miles from the nearest Chinese colonization, and about 120 miles from Kweihwa, on the main caravan road, stands the temple domain of Pailingmiao. This is the temple that has recently been made the "capital" of the autonomous movement undertaken by the allied Leagues of Olanchab and Silingol. The temple domain has for many years been the most important pasture ground of the Kweihwa trading caravans. Camels are conditioned here for two or three months every year in between journeys from Kweihwa to Chinese Turkistan.¹ The name Pailingmiao is jargon, *miao* being Chinese for "temple," and *Pailing* a corruption of the Mongol Beile-in, meaning "of the Beile," the hereditary prince of the Banner. The Mongol place-name of the temple is Bato Khalagha-on Sume, or colloquially Bato Khalakh-in Sume, Temple of the Firm Defence. The name is explained in the following Mongol legend:

The Mongols of this Banner migrated to their present territory from the Tushetu (Tushiyetu) Khan region of Central Outer Mongolia, in the reign of Shun Chih (1644-1662), the first Manchu Emperor to rule in Peiping. When they had been settled in their new territory for some time they decided to build a lama monastery. This they did; but they forgot to tell the Manchu Emperor, whose overlordship they had now recognized. The news gradually travelled to Peiping, and the Ejen Khan, the Manchu Overlord, was very angry to hear that a new temple had been built without his leave first having been petitioned. He therefore ordered a certain river to destroy the temple. Then began a contest between the river and the lamas of the new temple. The river set out from the water-parting already mentioned, between Shiretu Jo and Bato Khalakh-in Sume, and approached the temple. The prayers of the lamas checked it; whereupon, making a great loop, it approached the temple from a new direction. Again the lamas halted it with their prayers, and it turned away east, defeated. The river, for this reason, is still called Aibagh-in Gol, or River of Fear, while the lamasery is called Temple of the Firm Defence. This explanation of the name of the river, which refers it to the root of the verb *ayona* (written form, *ayomoi*), may of course be no more than popular etymology. It may in fact be a corruption of some other word. I believe that Mongol stories of this kind may reflect the old and strong feeling that the Mongols were only auxiliary subjects or allies of the Manchus, not subjects by conquest,

¹ See Owen Lattimore, 'The Desert Road to Turkestan,' London and Boston, 1927-28.



The Jirgalei Obo, or Rank of Obos, from the north



General view of ruins: northern wall in foreground



Rectangular ruined mound in the city



One of the largest mounds in the city



Detail of carved stone crosses



One of the larger crosses, with head of slab set slightly off centre



Carving on stones similar to those with crosses

and echo the covert struggle that went on, during the rule of the Manchus, to maintain the realities of Mongol separatism. According to another Mongol story, curiously similar to this one, the city of Peiping itself stands "askew" because a Manchu Emperor once cast doubts on the power of one of the great Mongol Living Buddhas, in the Uliassutai (Oliyasotai) region of Western Mongolia. The Living Buddha then sent a river all the way from Outer Mongolia, which began to wash away the city of Peiping, leaving it standing slightly "aslant" and forcing the Manchu Emperor to cry "enough."

It is in the valley of the Aibagh-in Gol that the Nestorian ruins are to be found. I have already mentioned, in the story of the ghost-possession of the Beile's wife, the tradition that bricks were "mined" from the ruins for the building of Bato Khalakh-in Sume. It is possible indeed that the temple, as a holy site, stands heir to the Nestorian city, and is older than the eighteenth-century establishment of the Mongols of the Banner. There may be a similar correspondence between the site of Kweihwa and the ruined city of T'o-k'e-t'o or Toghto. A slight change of position, of this kind, may mean that an effort was made to get away from any baleful influences that might be hanging around after the destruction of a celebrated place, while remaining near enough to carry on the old prestige and make use of the same geographical advantages.

I am not sure of the distance between Bato Khalakh-in Sume and the Nestorian city, as I have never made the direct ride between the two places; but I do not believe it is more than 10 or 15 miles. The city stands on the north bank of the "river," which is only a few inches deep and no bigger than a brook, at a point where another valley opens from the north. East of the city, at the junction of the two valleys, there is a jagged hill called the Agot Ol (written form, Agoot Agola) or Hill of Caves, from which the northern valley is known as the Agot Ol-in Gol. To the south, across the stream and on the far rim of the valley, there is a great *obo* or cairn, flanked by two rows of small *obos*—a not uncommon style. The dark, grey-black colour of both the great *obo* and the smaller ones is flecked with glinting white, from fragments of quartz among the loosely piled rocks. The quartz comes from an outcrop on the hill, and as it is the only white rock visible in the landscape, the brightness of the cairns is all the more distinct. White is the "good" and also the magical colour of the Mongols, and I assume that the gleam of white is associated by them with the legend of the *obos*. The whole line of cairns, with the great one in the centre, is known as the Jirgalei Obo, or Rank of Obos. The first story that I heard about them is as follows:

The ruins are those of an anciently powerful city, of Mongols and Chinese together, "like Kweihwa." Its enemies were strong, but never strong enough to take it. Then arose an enemy who was an Ejen Khan, or Overlord Emperor, somewhere, whose name was Sokhor Liu-tzu Khan, or Blind Liu-tzu Khan. He came in the night, and in one night built this row of *obos*, like soldiers, which by magic destroyed the city. According to most of the legends however Sokhor Liu-tzu Khan was Lord of the city itself, not its destroyer, and it was destroyed by "somebody else—perhaps the Moslems." As a matter of fact, the cairns may well have been built originally to "take the curse off" the site of the ruined city, after it was ruined; this would fit in well with Mongol ideas of geomancy. The mention of the Moslems however is interesting, as they are

to-day still influential in the Kweihwa plain. They are in touch through the upper Yellow River Valley with the Moslem Pale in Kansu province, and by caravan with the Turki Moslems of Chinese Turkistan. Undoubtedly their communities were founded by non-Chinese immigrants, not by Chinese converts. Moslem penetration into this region was in fact partly contemporary with that of the Nestorians, Manichaeans, and so forth; and it is more than probable that when these faiths declined, many of their adherents were absorbed by Islam.


West of the line of cairns there is a valley opening into the main valley from the south, the Kherei Gol or Crow Valley. A hill at its mouth is called the Sibe, or Gate. My Mongol companion, who was not a local man but a Jakhchin Ölot from the distant Altai in Outer Mongolia, remarked off-hand that the name Kherei, locally rendered as the name of a kind of crow, might in reality refer to the Kheriet tribe of the Altai region in the time of Chingghis Khan—the very tribe, ethnically intermediate between Turks and Mongols, which was largely responsible for the spread of Nestorian influences under the Mongol Empire. It was this tribe which was associated with the Central Asian legend of Prester John. There is possibly a link between this tribe and the present Kirei Kazaks of the Altai, who are nomadic Central Asian Turks, and Moslems by religion.¹ The identification of the name of a hill with an ancient tribe is of course purely speculative; but it was interesting to have the speculation made by a Mongol, who himself knew nothing of Nestorian Christianity.

The city itself is known as Yisun Sume-in Tor, Ruins of Nine Temples, and sometimes as Olan Sume-in Tor, Ruins of Many Temples. It measures, very roughly, about a quarter of a mile from east to west, and rather less than that from north to south. It is therefore, in size, more like a fortified post than a city. The original walled city of Kweihwa however (the walls of which have now been almost entirely destroyed) was not much larger; although its gate-fortifications were much more formidable, and its walls more massive. The walls of the ruined city are best preserved on the north and west, and almost obliterated on the east and south, toward the Agot Ol-in Gol and Aibagh-in Gol; perhaps by water action in years of flood. The walls were marked by vertical fissures at regular intervals, which indicated that they had been built by making hollow sections of planks, between which the earth was stamped down until it solidified: a method still common in China. I was not able to see whether the walls had ever been faced with brick.

Within the city are numbers of mounds, the ruins of buildings remarkable in size for so small a city. Most of these rubble-heaps had a rectangular outline, but some of them had a rounded base. Judging from their size, they are more likely to have been palaces, religious buildings, and public offices than private houses. The mounds had been deeply trenched into by men "mining" for bricks, and recent trenches, together with cart tracks leading out of the city, showed how bricks had been taken away for building the palace of the Jön Beise. Besides these open cuts, a number of holes and tunnels proved that treasure-seekers had been at work. The bricks used in the buildings were larger than those normally used by the Chinese in building houses, and comparable to those used in building city walls and important public structures.

¹ Douglas Carruthers, 'Unknown Mongolia,' London, 1913.

Many of them were marked with a hand-imprint—whether a religious symbol or a mason's or contractor's mark, I do not know. The fingers and thumb, in this hand-imprint, were not outspread but close and parallel, like the Red Hand of Ulster. Stonework did not appear to have been used except for foundations and ground-courses.

The most remarkable thing in the city however, which immediately drew my attention, was a collection of six or seven stone slabs, marked with crosses and carved decorative work. Several of these were lying singly, and may have been near their original positions. Others had been gathered into groups—obviously not because they fitted together, but because of their similarity. There may have been still others—I did not go over the whole of the ruins. The slabs that I saw—and I photographed all of them that I could—bore crosses of the kind well known as "Nestorian," similar in design to the bronze crosses that are found in many parts of Inner Mongolia, in the Kweiwha plain, and in the Ordos desert.¹ No slab was marked with more than one cross, and the cross was always at one end of the slab, the rest of which was usually marked with decorative designs. Several of the stones were bevelled on one long edge, so that the end-section had the following shape: . The flat or squared edges of such stones, opposite the bevelled edge, were socketed; and the cross at the end, instead of being centred with the axial line of the slab, was noticeably out of centre. Thus they were evidently not simple monoliths, to be set up on end, but parts of a design—conceivably the front of a Nestorian church. If this be true, then the church must have been an important building in so small a city. The stones averaged between 4 and 5 feet in length.

Tiles and fragments of pottery were not especially plentiful among the ruins. Two large pieces of white marble were conspicuous, carved with the conventional Chinese dragon. On one of them were half each of the Chinese characters *Chou* and *Shang*—the names of two "classical" dynasties older than the Christian era. The carving, it need hardly be said, was not contemporary with these ancient dynasties, but must have been part of a sententious, conventional inscription, with historical or literary allusions, in the pedantic tradition associated with Chinese public monuments.

Further evidence of specifically Chinese influence appeared outside the eastern wall of the city, in what had evidently been an important suburb. This kind of suburb is a common mark of walled cities in the frontier regions—notably Chinese Turkistan—as well as in China proper. The closing of the city gates at night makes it convenient for inns to be built outside the gates, in order to get the trade of late-arriving travellers. This, in turn, promotes the growth of market-places outside the city. In a trans-frontier city of this kind moreover it is likely that the city itself was reserved for the tribal princes and their following, while the suburb was allotted to resident Chinese merchants and visiting caravan traders. The Mongol city of Urga (now Olan Bator, or, in the written form, Olagan Bagator) is, for instance, entirely distinct from the Maimaich'eng or Chinese trading quarter. The specifically Chinese monuments in the east suburb were a stone tortoise, which had once borne on

¹ See Paul Pelliot, "Sceaux-amulettes de bronze avec croix et colombes provenant de la boucle du Fleuve Jaune," in *Revue des Arts Asiatiques*, vol. 7, 1931. Also Mark W. Brown, "The Romance of Nestorian Crosses," in *The Chinese Recorder*, February 1933.

its back an inscribed tablet: two lions, of the kind that stand at the gates of important buildings, and two figures of officials, of the kind that not infrequently guard the approach to a tomb. The heads of both human figures were missing, and it could be seen that one of them had been chiselled off; both had probably been taken away for sale to Chinese dealers, together with the tablet from the back of the tortoise. All of these monuments were of comparatively poor and obviously "provincial" workmanship.

This completed my survey of the city. The *obos*, several miles away, I had visited the day before. The hastiness of the inspection was due to trouble with my camels. They had been stampeded the evening before, and had been lost all night; they might have been lost altogether, had it not been for the skill in tracking of my Mongol companion. Camels that have been badly scared are hard to handle for some days, being subject to fresh panics. We were in a hurry to get them out into "clean," open ground, with nothing to scare them. The Mongol and I were each riding one camel and leading another; they were hard to hold, snorting and trembling and shying as they went among the ruins, and it took all the strength and skill of the Mongol to manage them while I dismounted and photographed. I could of course have camped at a distance and come back for a more thorough inspection; but I am not an archaeologist, and there was no point in inviting the suspicion of being a "treasure-seeker."

As we rode on from the city we passed the Agot Ol, the Hill of Caves already mentioned, which overlooks the city from the east. This hill is a comparatively abrupt, jutting head, conspicuous among the more rounded hills of the landscape. One edge of it, seen from the west, had something the profile of a human face, about two-thirds of the way up. The hill is pitted with caves, and I suspect that it contained important shrines at the time when the city flourished. It is said now to be full of snakes—probably adders, which in a place like this are considered holy by the Mongols. I found on the face of the hill one main ledge, behind which the rock had been cut away to a deep corner, while the ledge itself had been levelled up with large bricks. Many of the caves also had been artificially enlarged. I could not find a trace of statuary, plaster, or fresco; but in one cave there was a heap of small baked-clay objects, called *tsats* by the Mongols. These are lama-Buddhist cult-objects, and may be miniatures of the monuments variously called *chorten*, *dagoba*, and, in Mongolia, *soborgan*. When found in a place like this, it means that they have been "offered," in propitiation of a haunting spirit that is feared.

I have already given the story which described Sokhor Liu-tzu Khan as the destroyer of the city. This however is a variant. Most of the stories affirm that Sokhor Liu-tzu Khan was not the destroyer of the city, but "a Mongol of the Yüan dynasty" (which ruled over China from 1260 to 1368). He was lord of the city, and married a daughter of the (Mongol) Emperor. He then plotted to seize the throne, but his wife betrayed him to her father, who sent the troops that destroyed the city.

By far the most complete account however was one which I heard several weeks later and far to the east, from a Chahar Mongol. This was not surprising, because the recent activity of the ghosts within the city had caused tales to be remembered and repeated all over Inner Mongolia. The story runs as follows: In the time of T'ang (the T'ang dynasty, A.D. 618-907—this dynasty was

founded on an alliance with the Turks who dominated the north-western frontiers of China, and under its rule not only Nestorian Christianity but Islam, Mazdaism, Manichaeism, and other faiths of the Near and Middle East penetrated from Central Asia into China proper) a Chinese came through this part of Inner Mongolia, spying out the land, and saw a place that pleased him. Now at that time Sokhor Liu-tzu Khan was a simple commoner, called Liu-tzu. The T'ang man said to him: "I recognize this place as a special place, but I must make a test. I shall plant a stake in the ground here, and attach a long cord to it. You stay by the stake, and I shall go over the mountain with the cord. You watch and see, when I tug the cord, if the stake comes out."

So he went off, and Liu-tzu Khan watched by the stake. When the T'ang man tugged, the stake came out. But Liu-tzu Khan picked it up and planted it again, for he realized that the T'ang man was up to something special, and if there were any profit in it, he wanted that profit for himself. The T'ang man came back, and was disappointed. "No," said Liu-tzu Khan, "the stake never budged." "Strange," said the T'ang man; "I wonder if I can have been mistaken in recognizing this place. But I shall make another test." Then he put a hen's egg in the ground. His idea was to see if the egg hatched out in the night; but Liu-tzu Khan crept up in the night and found the egg, which indeed had hatched out. Liu-tzu Khan again realized that this was an omen which the T'ang man wanted, so he took away the hatched egg and the chicken and planted a "good-for-nothing" egg instead. In the morning, the T'ang man looked and was much disappointed. "That egg ought to have hatched out," he said. "Well, there is nothing for it. I must have made a mistake in my geomancy. This land is no good after all." Then they sat and talked for a while, and Liu-tzu Khan asked, "What special virtue was it you thought you had recognized in this land?" The T'ang man said: "If the land had been what I thought it was, it would have been such a place that, if a man buried his father and mother there when they died, he would have become Emperor. However, there is nothing for it; it is no good."

Then the T'ang man went away; but Liu-tzu Khan waited until his father and mother died, and buried them there: and sure enough, he became Emperor. When the T'ang man heard of this, he realized he had been tricked, and was furious. From his own home he shot an arrow, and it flew until it hit Liu-tzu Khan in one eye, and blinded him in that eye; and that is how he became Sokhor Liu-tzu Khan, Blind Liu-tzu Khan.¹ Sokhor Liu-tzu Khan's proper destiny was to reign as Ejen Khan or Emperor for eighteen years; but he made of every day a new-year's day, "just like Yüan Shih-k'ai when he changed the calendar; for did not Yüan Shih-k'ai shorten his destiny in the same manner?" And so his eighteen years were transformed into eighteen days, and his reign ended.

This story I heard from a lama, and a friend of his who prompted him with a few details. I found that neither man knew the names of any dynasties except T'ang (618-907), Yüan (1260-1368), Ming (1368-1644), and Ch'ing

¹ It is important to note here that while *sokhor* in the modern vernacular means merely "blind," and is so noted also in Kowalewski's Mongol-Russian-French Dictionary (Kazan, 1849; recently reproduced in Peiping in a photostat edition), I am told by Professor Pelliot that the original meaning is "blind in one eye."

(1644-1911). The dynasties, some of them Chinese and some "barbarian" by origin, between the T'ang and the Yüan or Mongol dynasty, had dropped out. This may be explained by the fact that the T'ang dynasty, which had important Central Asian Turkish affinities, was one of the truly great dynasties of the Mongolian frontier, and was never displaced in frontier legend by the Sung dynasty (Northern Sung, 960-1127; Southern Sung, 1127-1279), which was not only of Chinese origin, but always had a noticeable Southern Chinese, non-frontier affiliation. The so-called Five Dynasties (907-960) which filled in the fifty-four troubled years between the fall of the T'ang and the establishment of the Sung were too short-lived to be remembered in legend as distinct nations, although it is quite possible that some of the warriors of the period may have survived as folk-tale heroes. The Liao (907-1125) and Chin (1115-1234) dynasties also, though of great importance in Mongol legend, are not of primary importance, because they were of Manchurian origin, and are thus regarded as cognate forerunners of the Mongols themselves, rather than as major participants in the eternal opposition of Mongols and Chinese.

The magical details of the stories here given I cannot explain; but it is worth pointing out that the arrow shot from a distance is reminiscent of a story about the fixing of the border between Mongols and Chinese by an arrow shot (or pretended to have been shot) by Erh Lang, the second of the Eight Lang, or "Noble Youths," who are folk-heroes of the Chinese wars against the frontier barbarians. From this incident is said to come the name of the Lang Shan, a range in Western Inner Mongolia.¹ This in turn brings up the speculation that the name of Liu-tzu Khan may be a Mongol corruption of the name of Liu-Lang, the sixth of the eight hero-brothers, whose family or clan name is said to have been Yang. In this case the form Liu-tzu would be a diminutive, employed in a distinctly un-Chinese manner through Mongol ignorance of Chinese usage.

From the stories about Sokhor Liu-tzu Khan it is however evident that he was neither clearly Mongol nor clearly Chinese. Both Chinese and "barbarian" elements are mingled in the legends, as they are in the ruins of the trans-frontier city. In other words, it is fair to assume that both Khan and city belonged to one of those intermediate frontier peoples marking the division between true Chinese and true Mongols, who have been so potent in the history of the frontier. The legends are of a character which probably reflects a type of history rather than a specific period, and they may well therefore embody the confused echoes of several similar periods and chieftains whose careers were homologous.

In so far as the legends may refer directly to the Ongut however it is legitimate to comment on the curious detail about the telescoping of eighteen years into eighteen days. It is at least possible that this refers to a "foreign" calendar introduced by Nestorian Christians. The confusion, resentment, and even terror that arise from a change of calendar, regarded as a trespass on the sanctity of time, can be illustrated by the popular resistance to the introduction of a reformed calendar in eighteenth-century Europe; while the story as I heard it was pointed with a very significant allusion to the "curse" on the career of Yüan Shih-k'ai, after the proclamation in China, following the

¹ Owen Lattimore, "The Desert Road to Turkestan."

Revolution of 1911, of the Western solar calendar, replacing the lunar calendar familiar to both Chinese and Mongols. Another illustration may be drawn from the fact that the Mongols themselves anciently used a lunar calendar varying in a few details from the Chinese standard; the Manchus regarded this with peculiar repugnance, and endeavoured to place it under a ban.¹

I believe however that the city of the Ruins of Nine Temples has an importance transcending the handful of legendary details that I have been able to gather; an importance directly related both to the Nestorian crosses, which are the strongest kind of evidence of an important alien influence intervening between Mongols and Chinese, and to the frontier walls which, although so little studied, are undoubtedly of the highest importance in the history of Inner Mongolia. One of these walls runs east and west through Olanchab League, passing not far north of the Shiretu Jo temple domain.² It seems to follow approximately the "height of land" of the Inner Mongolian plateau, between the depression of the Gobi on the north and the plateau escarpment on the south. Owing to the height of the land, and to the extra height of the wall itself, it is usually swept free of snow all through the winter, and for this reason it is commonly used as a caravan road. Through the decay of centuries the wall has in fact been smoothed away until it resembles a grass-grown road with a rather high, rounded crown. The Mongols call it the Kharem-in Jam, or Road of the Wall, and it has of late years been much used by the motor trucks used in the opium-running trade under the control of the Chinese military. The opium is brought in from Kansu province by camel caravan, passing to the north of the Ordos deserts and the Yellow River Loop. At Pailingmiao it is turned over to the trucks. Part is then run down to Kwei-hwa, but most of it is taken on to Kalgan. By using the Road of the Wall, which runs through Mongol territory and is therefore free of Chinese bandits, the risk is minimized. When the trucks reach a point north of Kalgan, they turn south along the old Urga-Kalgan caravan road, making the shortest possible dash through the bandit zone between Mongol territory and territory firmly patrolled by the Chinese troops. The Mongols levy a tax on the opium trucks, for allowing them to run through Mongol territory. North of this wall there is another, designed apparently to defend the northern edge of the Inner Mongolian plateau, where the dip toward the Gobi begins; north of the Gobi, again, rise the grasslands of Outer Mongolia. The Nestorian city of the Ruins of Nine Temples stands between these two walls. Far to the east of the city, near the frontier between the Leagues of Olanchab and Silingol, the two walls actually cross each other at an angle—unless the crossing wall is a separate defence work; a possibility which I have not yet verified by observation.

The general subject of these outer frontier walls is a matter for separate discussion. The point which I wish to make here is that this Nestorian city, in its relation to the frontier walls, confirms one of the major aspects of the history of the Great Wall frontier. The Great Wall itself is not in fact a *linear* frontier: it is merely the most important delimitation of what is in fact a *zonal*

¹ 'Ta Ch'ing Hui T'ien,' or 'Institutes of the Manchu Dynasty' (edition of 1818), under the sections dealing with the Li Fan Yuan, the Board which supervised Mongol affairs.

² Owen Lattimore, "The Desert Road to Turkestan."

frontier, of which there are also other, minor delimitations. Apart from the fact that there are important variations even in the main line of the Great Wall, there is a whole system of small "outwork" walls, running all through Inner Mongolia, from Chinese Turkistan in the extreme west to Manchuria in the east. Important work on them has been done by Sir Aurel Stein in the extreme west and in the Edsin Gol region, and more extensive work in the Edsin Gol region has recently been done by Folke Bergmann of Dr. Sven Hedin's expedition. In the east and centre, as yet, no work has been done to determine even the complete topographical outline, age-levels, dynastic affiliations, periods of rebuilding, and so forth. This much however can already be postulated. The various "outwork" systems, north of "the" Great Wall, in some sense represent tidal marks in the alternating pressures of nomad peoples on the north and the agricultural Chinese on the south. It is easy to interpret them as marking the different levels at which the Chinese have confronted the Mongols—or people equivalent to the Mongols in historical function; like the Hsiungnu, Central Asian Turks, Khitans, Nüchen or Juchen Tatars, and Manchus. This however is an over-simplified interpretation. Along the lines of these walls there have, in fact, recurrently appeared marginal or zonal peoples, the political equivalents of the zonal rather than linear geographical frontier.

The function of such peoples was to fill in the gap between true agricultural Chinese and true pastoral, tribal, "barbarian" Mongols, which otherwise would have been too awkwardly abrupt. They must have been, in culture, partly farming and partly pastoral peoples, partly merchants and town dwellers and partly warriors, in some sense "nations" and in some sense tribes. Ethnically, as well as culturally, they must have been recruited from both main divisions, the barbarian and the civilized. Politically, and for military purposes, they were adapted to serve either as agents of imperial expansion from within China or as auxiliaries of conquest from Mongolia. I believe myself that on the average they worked in favour of the trans-frontier rather than the cis-frontier; but that is a matter of detail. Functionally, they were competent in either direction, as is proved by the example of, for instance, the Tumet Mongols, who under the Ming Dynasty at one time raided as far as Peiping, who later became a kind of subsidized "frontier wardens" of the Ming dynasty, and who on the fall of the dynasty transferred their allegiance to the Manchus. At one time moreover they nearly became the dominant power in Central Inner Mongolia.¹ The Onguts can only have been such a people. Their Nestorian religion was one element in the mixed culture necessary to their intermediate position. They held the rich Kweihwa plain—which must then have been a granary, as it is now—and extended northward into the Inner Mongolian plateau, where their territory was probably delimited by the walls which can still be traced. Undoubtedly these walls existed, at least in part, before their time, and had served the purposes of similar marginal peoples in earlier times. With grain-lands in the south and access to tribal lands in the north, they had the same natural advantage in the caravan trade that the Kweihwa territory has at the present day.

¹ See Owen Lattimore, 'The Mongols of Manchuria'; also J. F. Baddeley, 'Russia, Mongolia, China.'

"The people get their living," says Marco Polo, in describing this region, "by their cattle and tillage, as well as by trade and handicraft," and he adds that "here also is what *we* call the country of Gog and Magog; *they*, however, call it Ung and Mungul" (Ongut and Mongol, that is) "after the names of two races of people," and so forth. Whether the reference to Gog and Magog can be stretched into an allusion to frontier walls, as Yule believed, or whether it is merely Polo's own interpretation of Ongut and Mongol, is really of minor importance. The significance of Polo's description of the province of Tenduc is in the references to mixed and marginal peoples; we know for ourselves that where such peoples are found in the history of the Great Wall frontier, their territories can be identified with outer walls. "The rule of the province," says Marco Polo, "is in the hands of the Christians . . . but there are also plenty of Idolaters and worshippers of Mohammed . . . and there is also here a class of people called *Argons* . . . or, in other words, sprung from two different races: to wit, of the race of the Idolaters of Tenduc and of that of the worshippers of Mohammed. . . . You find throughout those seven days' journey plenty of towns and villages, the inhabitants of which are Mohammedans, but with a mixture also of Idolaters and Nestorian Christians. They get their living by trade and manufactures."¹

It has been pointed out already that both Islam and Nestorian Christianity must have reached this region before the rise of the Mongols. In other words, Polo's description not only fits the Ongut people and their country; it applies, generally, to a *type* of people and a *typical* region; and the importance of both people and region is that they were standard phenomena of the age-old frontier. The political importance of the Ongut was in their position between the Mongol Empire in China and the tribal lands in which the Mongol power had originated. There developed, after the active period of the Mongol conquests, a recognizable lack of cordiality (which can be traced in the quarrels over dynastic succession) between the Mongols of the farther north, who considered themselves both heirs and guardians of the true Mongol tradition, and the Mongols who had moved inward on China to hold frontier cantonments and interior garrisons, and to live off the revenues of conquest, finding their careers at court or in administrative appointments rather than in fresh conquests. The shadow of this ancient dislike still lies between Inner and Outer Mongolia, the heirs of these two major Mongol divisions, although both territorially and tribally Inner and Outer Mongolia have altered considerably from what they were when Outer Mongolia was the womb of all the Mongol conquests and Inner Mongolia the cantonment-zone which buttressed the Mongol Empire in China.

In those days there was always a certain danger of dynastic quarrels, not only over the question of succession to the throne in China, but over the question of whether the Mongol Emperor in China should also be recognized as truly paramount over the Mongols of Outer Mongolia, whose chiefs were also descended from the House of Chingghis. Peoples like the Ongut, whose interests did not wholly coincide with those of the Mongols in Mongolia, but did coincide with those of the ruling house in China, had therefore an impor-

¹ Sir Henry Yule, 'The Book of Ser Marco Polo,' ed. Henri Gordier, 3rd edition, London, 1921.

tant insulating function. Their most direct interest lay in maintaining the balance of power, and with it the existing order. Revolt against the Mongols within China was obviously to their disadvantage; but an Outer Mongolian challenge to the paramount authority of the Mongols established within China was also inimical to their middle position. Racial mixture was an important, and probably an essential, factor in the historical activities of marginal peoples of this kind. Several tribes of the present day still have this character: notably the Ordos Mongols, the Tumets—both those of the Kweihwa region and those of Jehol province—and the Kharchins. Such tribes are not only "Inner Mongolian" but within Inner Mongolia belong specifically to the southern or Chinese border, rather than the northern or Outer Mongolian border.

In the case of the Onguts it is probable that the Nestorian religion connoted a certain amount of Turkish blood. They may have been linked, tribally, with the Uighurs, who in turn were probably a marginal people intermediate between Western Mongols and Central Asian Turks. The Uighurs were probably the western equivalent of the still-surviving Daghors of Manchuria in the east, who are a fusion of Eastern Mongols and Manchu-Tungus. It is still a Mongol tradition that when Chingghis conquered the Uighurs, in the course of uniting all the Mongol tribes, he broke them up and distributed them among the various Mongol tribes, in order to make use of their superior sophistication, and especially of the fact that they had a written language—which the Mongols did not yet have, although, after one or two false starts, they finally adopted an alphabet modelled on the Uighur script. This made the Uighurs, whose language was related to that of the Mongols, especially valuable as scribes and civil servants. It is said that the name Oigor or Uighur still survives, as a clan name, among the Ordos Mongols.

The possible combinations and recombinations of mixed blood and mixed cultures are illimitable. It can hardly be doubted that Lama Buddhism was influenced by Nestorian Christianity, and also by Manichaeism and other religions which, after being brought into Chinese Turkistan, radiated afresh into Tibet, Western China, and Mongolia. In the same way, it may be postulated that there is some blood-continuity between the Onguts of the thirteenth century and the Tumet Mongols who later held the Kweihwa plain and the frontal escarpment of the Inner Mongolian plateau. Above all, the evidence of important Nestorian influences, both in the Kweihwa plain and on the plateau more than 100 miles to the north, indicates that the people who lived under this religion were not a minority group, but had something of the stature of a nation. The juxtaposition of Nestorian and Chinese monuments, and the mention by Marco Polo of Moslem and "half-breed" communities, is evidence enough of their mixed culture. The inclusion, within their orbit, of both grazing grounds and farming land is evidence of their mixed economy. The delimitation of their territory by the main Great Wall (south of the Kweihwa plain) on the south and by outer frontier walls on the north is evidence of an intermediate political position.

In the circumstances perhaps the most likely interpretation of the standing of the old Nestorian city now called the Ruins of Nine Temples is that it was the "northern capital" of the Ongut people, corresponding to a "southern capital" (the city of Tenduc) in the Kweihwa plain. Such double capitals are

a standard phenomenon in the history of every dynasty and minor state based on "barbarian" conquests in China. The Khitans, the Nüchen or Juchen Tatars, the Mongols themselves, all had southern capitals in China and northern capitals north of the Great Wall. Under the Manchu dynasty Mukden long maintained its importance as a northern capital, although partly displaced by a new summer capital north of the Great Wall at Chengteh or Jehol City. The northern capital regularly served to keep up the connection between the dominant power and the sources of its military ascendancy beyond the Great Wall, while the southern capital was the administrative headquarters for the control and exploitation of the dominated territory within China. The parallel, in the case of a minor state like that of the Onguts, was in a northern focus maintaining its tribal connections, and a southern focus maintaining the privileged position of a people who were "wardens of the marches" of the Great Wall. Even purely Chinese dynasties like that of the Ming, coming between Mongols and Manchus, whose first capital was at Nanking, on the Yangtze, have always tended to acknowledge the strategic importance of the Great Wall frontier by setting up an administrative capital in the north, at Peiping or at some strategic point in Honan, such as K'aifeng; even though the lower Yangtze valley continued to maintain its importance as the centre of culture and civilization. The persistence of the tendency can still be seen in the dualism of a kind of unofficial northern capital at Peiping, and a national capital at Nanking.

Perhaps the most important conclusion to be drawn from all this is that Mongol history, as well as Mongol geography, is a complex problem, not to be so simply treated as has been usual in the century and a half since sea power became dominant in the affairs of the Far East. We cannot discuss "the" Great Wall, but must take into account a whole zone. We are not entitled to assume a "desert" Mongolia and a "fertile" China. Nor may we write history in terms of Mongols who are all tribal nomads and barbarians, in contrast with Chinese who are all peasants or townsmen and all civilized. Quite on the contrary: the multiplicity of gradations and variations is astonishing, and the interwoven pattern of geographical and historical correspondences much richer than is commonly supposed. Because Mongol history has been more or less dormant ever since the seventeenth, or at least the eighteenth, century, there has been little to offset the tendency to over-simplify it and reduce it to a mere chronicle of barbarism. In our own time however the penetration of Russian influence among the Mongols from the north, and more lately the extension of Japanese influence from the east, are hints that new combinations in political geography are to be expected, co-ordinated with physical and strategic zones; and with them new creations in intermediate cultures. The geographical frontier zone and the "marginal" nation are likely to be as important again as they were when Yisun Sume-in Tor, the Ruins of Nine Temples, was a city alive and thronged; when men in Chinese silks, who spoke a Mongol or Turkish language, attended Nestorian Christian services in churches of which nothing now remains except a few crosses on stone, a few amulets in bronze, a few reminiscences in legend, and perhaps a few distorted echoes in the liturgies of Lama-Buddhism.

EXPLORATIONS NEAR THE BORDER OF WESTERN AUSTRALIA

MICHAEL TERRY

DURING the last eleven years I have led twelve expeditions in Australia whose principal object has been to search for minerals of commercial importance. This programme has been made possible largely by the backing of Adelaide syndicates, and has enabled us by co-ordinating results to check the work of previous expeditions and to amplify substantially our knowledge of the area bounded by latitudes 19° to 27° S. and longitudes 128° to 133° E. I discussed the portion between the Darwin-Adelaide telegraph line and the border of Western Australia in the vicinity of the Petermann and Tomkinson Ranges in the *Geographical Journal* for October 1931, and now propose to deal in particular with the neighbourhood of the 129th meridian, that is, the border.

While our particular object has been to study mineral occurrences, the scope of our field work has been widened to include reconnaissance survey, soil study, meteorology, and the collection of specimens for the Adelaide Museum. Soil samples and flora notes have been collected for Professor Prescott of the Waite Agricultural Research Institute, a branch of the Council of Scientific and Industrial Research; wind directions and pressures, cloud movements, and daily aneroid readings have been handed to Mr. Bromley of the Commonwealth Weather Bureau; museum collections have gone to Mr. Hale: all to Adelaide institutions. In return for our soil work the Waite Institute makes available a draughtsman who plots our field notes, and by courtesy of the Institute copies are run off the original tracing (which with all field books is retained there) for the Lands Departments and learned societies particularly interested. By such a system it is believed that our observations become known where they may be of interest.

For the earlier portion of the work we used motor transport of various types, then a combination of truck and camel parties, and latterly camel strings alone. For although there are few portions of the interior where motor vehicles may not be taken, such are the difficulties involved in getting through open sandhill country (as contrasted with a mixture of hills and fiery-red sandhills, where places shielded from drifting sand provide good travel) that it is best sometimes to fall back upon the slow but steady camel. This however mainly applies to north-south travel, for the sandhills are as a whole regular and parallel, bearing about 10° south of west by 10° north of east. Therefore during steady east-west travel no undue difficulties may be met; it is a very different tale should one essay to turn north or south. However should circumstances necessitate the use of motors, the task may often become less arduous than anticipated, for the sandhills are not nearly so continuous as generally believed; undulating plains are interspersed amongst them. Some are only flats a few miles across, while at times one comes across great open spaces extending to the horizon on either hand. Gibson Desert, west of the Rawlinson Range, is the most notable example. It is composed of red sandy loam covered generally by fine lateritic gravel with thickets of mulga,

mallee, broad-leaf gidgee, and similar desert scrub up to an average of 25 feet. The troughs of the undulations often carry a few scattered short sandhills, in this area trending NNW. by SSE. Therefore broadly speaking motors may go in any desired direction without hindrance. Farther north in the vicinity of Lake Mackay there are big plains, lateritic also, but carrying little or no mulga. The growth is more stunted and is typified by stunted mallee, silver-leaf box, low acacias, and occasional gum trees of desert type, but very often having widely scattered areas of the large, gaunt, but attractive desert oak, a hardy casuarina with a black bark and possibly the toughest of all Australian hardwoods. It is a beautiful wood, highly white-ant resistant and in great favour for bush-house construction. Unfortunately in warm weather the ground beneath such trees is almost invariably a running mass of tiny black ants which night and day pester both man and beast; a pity, for even during the stillest of nights the foliage rustles and gives out a soothing sound like the noise of a big sea upon a distant shore. Many believe that the sandhills of the interior are steadily on the move and that therefore where this year rocks may be totally obscured, in a few seasons there will be new formations exposed. This is incorrect.

Practically the whole of the inland, plains and sandhills alike, is covered with varieties of triodia, the coarse wiry spinifex grass which grows in almost circular mounds whence protrude sharp sunburnt grass-spikes whose pricks if neglected can develop into unpleasant sores. Amongst this grow varieties of scrub and, occasionally, thickets of larger trees which may extend in a long narrow belt across plain and sandhill uninterrupted for several miles. Under normal conditions of rainfall the sand is anchored by this herbage, and it is only in the stocked areas of settlement where cattle have eaten back the herbage that any appreciable movement of sand occurs during a drought. The far western country, being still undisturbed, remains anchored except for some superficial drift along the crest of sandhills, as a rule near stony hills where, it seems, wind deflections have caused eddies. Proof of this anchorage may be found in the trees, up to forty years old, often noted growing along the sandhill tops.

It is commonly said that sandhills up to 100 or even 150 feet high may be found far out west. To check this we measured a large number of heights by aneroid and took the mean of ascent and descent readings on either side of the hill while riding over it on a camel. The most outstanding examples were tested where the hills looked 100 feet high. The highest hill measured no more than 48 feet above the sandplain at its base. These sandhills have nearly all formed from the south; the longer sloping side faces south, while the shorter and much steeper one, capped by the drift along the crest, faces north. Error in estimating heights may be due to not separating true sandhills from stony ridges which have caught, and been partially covered by, drift sand.

There must be many points in the operation of the camel, the mis-named dromedary of this country, which will interest the camelman of other deserts. The modern system of packing and riding has been developed from the style of the Afghans who have taught white men how to handle this beast. For ordinary work on roads or pads the loads may be of equally weighted stacks

of cases or bags roped or wired together and simply joined by ropes, so that they hang over either side of the pack-saddle without a girth or stay; but for trekking across unbroken country it is almost essential to have all goods cased in stout boxes wherein they may be carried loose. The battering to which all loads are subjected during a march through scrub quickly smashes the ordinary packing-case and rips open bags of flour, so that heavy losses of precious stores soon occur. The pack-boxes may measure up to 3 feet high, 17 inches wide, and 2 feet long, that is, along the saddle. One-inch tongued and grooved boards may be used, but quite light boxwood, if carefully strengthened by metal strapping, greatly reduce the weight and are strong enough to withstand the severe bumping they get sooner or later when a frightened or unruly camel bucks its load off. These boxes have a horizontal bar attached to the saddle side of the box for the cross ropes which go over the saddle and so support them when the beast gets up. We carry water in big sheet-metal canteens, shaped to conform to the curve of the saddle, and holding up to 27 gallons apiece, that is, a gross load of some 600 lb.

At the start of a long trip into dry country where it is necessary to reduce the string as low as possible because of the difficulty of finding sufficient water, loads (provided good camels have been obtained) may all be up to 6 cwt. exclusive of the saddle, which can weigh from 60 to 90 lb. This means a heavy lift of 3 cwt., and so big strong men, both black and white, have to be picked for the expedition; only three persons can comfortably get to work on each box. As a rule a riding camel is taken for each white man, and where the party is of three, with two natives as camel boys, the stores and equipment for an eight-months' trip can be carried on nine pack camels, two of which carry water. On the last trip by having one canteen camel and making each riding camel carry a small pair of canteens (8 gallons per pair) we set out for five months with six pack and three riding camels.

It has often been said that the camel never varies the length but only the frequency of his stride in order to increase the pace. As the speed of the string and the time of travel decides the distance for plotting one's position, we took particular notice of this point, and as a result recorded quite contrary figures. Our conclusion is that the camel does not vary its frequency of stride at all, but lengthens or shortens its stride as required. The leading camel was observed each time, at speeds varying from 2.75 m.p.h. to top speed at 3.3 m.p.h. on the road near Alice Springs. At the lower speed the regular one across country, the camel paced 76 strides per minute when a man walking alongside was doing 103; this was over spinfex country than which there can be little more vexed walking. On the clear hard road the camel still did 76 while the man extended to 109. The modern motorist may think it strange to differentiate between 3.3 and 2.75 m.p.h., but in our work it is vitally important to gauge the speed to within an eighth of a mile per hour, for, though this will involve a maximum error of 1 mile per diem, nevertheless at the end of a week one can still be 6 miles out in plotting the position of camp. The most common error is to overestimate the speed, and in the instance of Warburton this resulted in an error increasing to a maximum of 30 miles at Johanna Springs. His latitudes, because of observations, are fairly correct, but all longitude positions have to be moved east proportionately along his traverse.

Similarly Weston, who went south from Tanami in 1916, concluded he reached latitude 22° S. and had there found a new lake. But on investigating his claim, which involved Mackay's subsequent claim to have found a new lake there, and has so made the Lands Department uncertain as to which name to accept, we were convinced by a most careful interpretation of Weston's traverse that he rode no farther south than latitude $21^{\circ} 23'$, and so double banked on Warburton's Lake White by misidentification. We have reported to this effect.

When a party is moving on compass traverse on a general north-south route this misjudgment of speed will introduce error, primarily, in latitude, for the compass should keep the course fairly true to the correct meridian. When going east-west it is clear that the mistake, during field plotting of the position, will be in longitude. Provided however the traverse can be reconciled to a fixed datum at both its ends, these field mistakes can be determined and the needed corrections applied after the expedition. To maintain a reasonable degree of accuracy in the direction of the course it is vitally important to make no attempt to steer blind if any object, however inconsiderable, lies more or less adjacent to the traverse. By making from point to point and checking each stage by forward and backward bearings the factor of drift is almost eliminated, and although what might have been a theoretically straight course becomes a series of "tacks," nevertheless much more accurate navigation results. It may seem to many an unneeded stressing of the elements of compass work even to mention this simple point, but, in this country at any rate, it is surprising how very few bushmen appreciate what a false friend the compass may be.

At times a man with only one or two camels may travel at surprising speed across a dry belt of country, but the fair average distance for a loaded string, having due regard to keeping the camels in good condition during a long trip, saddles in repair, and the whole outfit maintained in proper order, is as near as possible 100 miles per week: that is, 15 to 17 miles per day across country for six days. On roads this is easily increased to 25 miles per day, or 150 miles per week.

The system of navigation used is plain straightforward compass dead reckoning, checked by the largest possible number of cross bearings. Crude though such methods are, it is surprising how low the factor of error can be reduced once experience has taught what corrections should be deducted from actual distances measured and compass readings. In the first instance the time of every happening during the day is booked up in a small notebook carried by the navigator. The minute of starting and finishing, every halt, however brief, the slightest deviation from the planned route, changes in country, bearings on nearby features; each of these items is so that from the gross hours of travel the halts by the wayside may be deducted and so render the true distance by converting the hours and minutes to the nearest tenth of a mile based on the estimated daily speed or speeds. This figure is then analysed to determine the distance on each bearing so that at the end of the day one may enter in the traverse entry book the distance and bearing of every section of the route. The distance estimated is now subject to a reduction of 9 per cent. to allow for deviation amongst anthills, bushes, etc., which defeat

dead straight approach to an objective. The records so obtained are roughly plotted in the field and local features sketched in as a stimulant to memory when, at a later date, the task is properly done in a survey office. When the route has been so plotted before topographical data are added it is treated as a section map and reconciled to the nearest position or positions whose latitude and longitude have been determined by official survey or by a reliable private individual. The finished work is then subjected to severe tests, and it is doubtful if any position on the maps recently issued is more than 2 miles in error, which in an initial reconnaissance may be considered satisfactory. All points should readily be identified by later travellers, and as time goes on tightened up till they are placed to the standard of departmental survey. In connection with this an experiment has been tried which it is proposed to continue. At the points of other travellers which can be identified without doubt and at our own new points a pile of stones is built in some prominent position. In this cairn a tall wooden pole is mounted and on it inscribed deeply the name of the place, the date, and the initials of the leader. Thus doubts as to correct identification are banished.

Many interesting facts have come to light during the plotting of the 1933 traverse. Having used Mount Hardy, very recently fixed by trigonometrical survey, as the principal eastern datum, we agree with the latitudes of Maurice and Murray (1902) exactly at Vaughan Spring and Whittington Soak. Our longitudes however place them farther east than heretofore. The closed traverse of this year shrinks the route of last year, out to Lake Mackay, considerably and places the lake partly in Central Australia, likewise moving all points *en route* farther east. During field work we suspected that our farthest west coincided with the Bluff marked by Carnegie south of the Stansmore Range; a suspicion which has since been strengthened, for we tally almost exactly with him in latitude but place the longitude about 25 miles east of his marking. This can be explained by reference to Mackay's Aerial Survey, when he fixed the western shore of Lake Macdonald by wireless time, thus moving the previous position about 25 miles east also. By adapting Carnegie's route to the new relative position of the 129th meridian we close his Bluff to our Bluff in a fashion which indicates both to be identical. Moreover we carefully scanned the country westwards from the Bluff, and observed nothing to suggest error in our conclusion. It was featureless except for a low north-south rise about 20 miles west, but this could not be reconciled to the Stansmore Range.

This adjustment to Carnegie's route also affects Warburton's positions; he moved Lake White nearly 20 miles east, and we presume to move it even farther because we have a closed traverse and not distant fixed points totally denied to the original explorer. Although we did not find Mary Springs to our sure knowledge, it is obvious that it should be moved considerably east of the present accepted position. During our search for it we noted that although Lake White was moved east after Carnegie's report, the Spring was left as originally marked by Warburton. Thus it became only 11 miles from the lake, whereas by his own map one feature scales 31 miles from the other. Seeing that we presume to move the lake as above mentioned, to be consistent the same adjustment must be made to the spring. It will be noted too that we have moved Mount Farewell 23 miles east, maintaining however the



Looking west along the Alec Ross range



Part of Lake Hazlett in Hidden Basin



Forest of desert oaks between Mount Olga and the Petermann Ranges



Cairn and pole erected at places named on our expeditions or identified from accounts of earlier journeys

original latitude. In this we are even more sure of our ground, for the work of last year and this year tallies very closely and check shots over long distances to such points as Singleton, Davenport, Hardy, and Farewell tie up surprisingly closely. And as Farewell is only about 60 miles from Hardy we feel whatever error we have made must be too small to be noticeable on the scale used on our plan.

Travelling back to Singleton we endeavoured to navigate to Waterloo Wells (Warburton), but although we must have passed close to the place no sign of it whatever could be noted. The nature of the country did not suggest the presence of water either as regards herbage or birds, nor were any native tracks noted. A native well farther north has been used by whites once or twice—it is called Dingo Well—and I have heard it said that this may be really Waterloo Wells. But we cannot accept this, for Warburton's description does not tally at all, nor did he make any appreciable error in latitude. We are therefore forced to the conclusion that during the sixty years which have elapsed since it was discovered, the place has dried up during a drought and has been subsequently covered by sand.

About 8 p.m. on the evening of 13 June 1931 a very large meteorite fell to the east of where we happened to be camped, at the north-western end of the Warburton Range. It was so bright that the countryside was illuminated with a pea-green light, and features as far as 3 miles away were distinguishable. It had a tail of several large blue-coloured fragments, but the light vanished, and with it all sign of the body when it seemed to be some distance above the horizon. We concluded that it had burnt itself out, and were therefore most surprised to hear what we feel sure was the impact just about five minutes later. It sounded like a "ton of dynamite going up"! A compass reading was taken on the agreed direction of the arrival of the sound, from which, by computing the speed of sound, we calculate that the meteorite fell about 60 miles north-east of the extreme north-western end of the Warburton Range. Upon return to the district in November 1932, while making from the Rawlinson Range to the Warburton Range, we intended to try to find the crater. However a burst of heat in the bad sandhills distressed the camels, and we had to do a forced march for three nights to save all hands. Thus the search to the east of the Bedford Range had to be abandoned, but should it be resumed some day when I am again in those parts it is to be hoped that the crater will be found, and perhaps some interesting data collected from it.

About 250 miles west of Alice Springs we were pleased to find occurrences of potassium nitrate. We found strong traces of nitre extending over a mile along the scarp faces of the Ordovician sandstones of the range, at first in curious *vughs* on the face of a slightly overhanging cliff. Although of stone and caused by weathering, these *vughs*, side by side, are like honeycombs or martins' nests. Most of them were open, but quite a number were thinly sealed and could be opened easily by a light blow with a pick. Inside them were deposits of white powder, identified in the field as nitre. A general scout sample was obtained over the entire area and reduced to assay size, the result being to establish that the salt contained 84 per cent. KNO_3 (nitrogen pentoxide 44.9 per cent., potash 39.65 per cent.). It is notable that no iodine was present, and that the proportion of chlorides was remarkably low.

To try to discover whether the salt might go right into the sandstone we levered off some large fragments and found many seams of nitre, up to $\frac{1}{4}$ inch thick, running criss-cross through the rock. A further effort was made, by drilling into the solid face, in an attempt to dynamite down a large quantity. Unfortunately the holes "bulled" and did little effective work. But the bore-hole samples were retained for testing and showed water-soluble salts up to 3.32 per cent., from which it may be inferred that the nitre goes right into the rock and is therefore an intimate associate and not of purely superficial origin. Although in 1928 Sir Douglas Mawson¹ inspected an occurrence 3 to 4 miles north-east of Goyder Pass in the western MacDonnell Ranges and concluded it to be a recent introduction into the sediments resultant from the excreta of animals in caverns now collapsed, we cannot see anything to suggest this in our deposit. The salts seem to have been laid down with the sediments, for at the Ligertwood Cliffs, 100 miles farther west, and at a sandstone outcrop south of Mount Davenport, 80 miles north, occurrences similar to the original prospect were noted. It seems therefore to be a general associate with the Ordovician sandstones of the area, and as such of possible commercial importance. This however must be decided by an expert who specialises in nitre deposits. It is interesting to have found this salt, after so many have tested old salt lakes in hope of concentrations, at what may be the source, that is, where it is *in situ*. As part of the general routine a sample of the bottom is taken wherever salt lakes are found of any size. Such a trial of the north-east corner of Lake Mackay showed that bicarbonates, nitrates, and borates were absent. Total saline material was 26.17 per cent. of which 20.08 per cent. was calcium sulphate and sodium chloride 4.17 per cent. Potassium chloride was only 0.93 per cent. At Hidden Basin no samples were taken at the two large new dry salt lakes there, but if a return trip can be arranged this will be part of the programme. These samples are taken with a post-hole auger of 3 inches diameter and to a depth of 43 inches.

From the general mineral point of view the area now being reviewed is disappointing: the results of prospecting so far have not revealed any deposits of workable size or value. Where the granites are most strongly developed they are generally of micaceous character, as in the Petermann Range area. North from that section they are rarely seen until the Ehrenberg Range, where hornblendic gneiss and dolerite dykes predominate. West of Mount Davenport there is a strong development of hornblendic granite and on its western limit a considerable area of schist where nicely mineralized reefs caused us to put in detailed work. Apart from iron and some copper the only encouraging stone was an occurrence of arsenical pyrites with gold, silver, and tin, but in small quantities. No payable gold values could be found, which tallies with the reports of Thomson, who tried close to here in 1927.

To the south of Mount Stanley quartz blows and ironstone reefs were noted and tried for negative results; I believe this section to be a possible extension of a remarkable formation, including hidden portions concluded to join up, traced by us, for 56 miles east-west along the immediate southern base of the Hann Range. Starting about 4 miles west of the Darwin-Adelaide telegraph and 60 miles north of Alice Springs, we tried it until near Mount

¹ *Mineralogical Magazine*, March 1930, vol. xxii, no. 128.

Wedge, at which point it was still continuing westwards, but circumstances forbade further trial. The auriferous country associated with Tanami and The Granites appears to cut off abruptly about latitude $20^{\circ} 50' S$. Here the sandhills commence and either the old rocks dip deeply or else they are superficially covered with sand; anyhow the prospector has practically no exposures to test south of this line till the vicinity of Mount Davenport. Our conclusion is that, taken as a whole, this section of the interior has little to attract the prospector in the way of a large new field of minerals; he can only hope for a minor and perhaps lonely deposit. This we have had to find out for ourselves by a series of expeditions planned to build upon each other, and so, as systematically as possible, comb the area. Although the southern section in the vicinity of the Petermann ranges has been given ample attention since its exploration by Gosse and Giles in the early seventies (over eighty parties are known to have been out there on various quests) the northern section, because of its more difficult nature, has not had much attention since Warburton (1872), Tietkins (1889), Carnegie (1890), and Maurice and Murray (1902). Weston went south from Tanami to Lake White in 1916, but apart from these parties there is no record at all of the country until the rather belated report which we now make.

And yet certain prospectors have recently influenced backers to send them out to alleged lost finds of their own, supposedly made a long time ago but left alone for no clear reason. Such false scents do immense harm to prospecting, for soon, unless the shareholder can be promised the rediscovery of an immensely rich reef or a veritable mountain of gold, he will be reluctant to support the proposal. Prospecting in this region is a long and tedious game, for it is comparatively rare to find an exposure where hope can be reasonably entertained. Nevertheless, by combining general stocktaking with such activities, benefits, although not of pecuniary character, can be derived from the travels of a party.

Aboriginals in this area are not found in large numbers, and, as a rule, wander in small bands up to half a dozen. Our experience has been that if left alone or made to appreciate during brief periods of acquaintance the privacy of a white man's camp, they give no trouble and are not antagonistic. The only instance of friction was near Sladen Waters in the Rawlinson Range, when on the night of 26 October 1932 two rushed into camp about 8 p.m. and were in the act of spearing O'Grady and me, when our camel boys saw them and gave such howls of terror that they were themselves apparently frightened and deterred from their intention. Near here Hanson and Smith disappeared the year before, and, it has been concluded, were done to death; a police party sent out to investigate did not run the culprits to earth, so perhaps in this area the black fellow thinks he can attack with impunity. But this must not be taken as typical of the whole of the tribes. Otherwise we have found them only too anxious to lead us to water, but we find it better to discover our own supplies as the savage cannot convey the quantity he will show, and may therefore put a camel string in a very difficult position, having indicated an ample supply by the standard of his own requirements. By studying dingo pads, native tracks, movements of birds, flora, and general topography, we find the local soaks and rockholes, and at times, travelling in the direction

of succeeding burnt areas where hunting parties have looked for game, discover a regular "road" leading at short intervals from one water to another. Such roads seem to exist from Salvation Rockhole to Mount Stanley, from Mount Singleton to Lake Mackay, and from the Alec Ross Range to Tanami.

Water however is not an invariable need of the aboriginal. We had this well illustrated to our discomfort while following up a small party near Mount Farewell. When we caught them up, camped on water as we had fondly hoped, they had been four days during warm weather without a drink, were not carrying anything to hold water, nor were they in any hurry to go to a supply. We discovered that they subsisted on the moisture from yams, a succulent tuber widely spread in the locality. In conversation with other natives we learned it to be a common practice in this section to go very long periods without water, so it behoves the camelman to go warily should he decide to follow up a travelling party. Incidentally the old fellow, head of the yam party, performed a memorable ceremony after he agreed to take us to a rockhole. Having returned to his camp for his weapons, solemnly holding his spears at arm's length, he approached our head boy, who was also carrying spears, and without a word exchanged his weapons with those of Lockey. Inquiry brought to light that this is an ancient custom of peace making, for by such an interchange a bond of good intent is established. In their own words, "Him all same brother now, can't fight, good fellow longa me."

Since 1920 an Aboriginal Reserve has been declared amounting to 65,600 square miles. The boundaries are determined by 75 miles west of the 129th meridian, 150 miles east of it, 146 miles north of latitude 26°, and 146 miles south of it. The portions in the three states of Western Australia, Southern Australia, and Central Australia are under the separate authority of the Protector of Aborigines in the state concerned. And just recently the Central Australian portion has been extended 40 miles farther north to include the Ehrenberg Range. Regulations regarding entry into this Reserve have not been stringent until lately, when a strong tightening up of permits has been increasingly evident. Now no person seeking minerals or following commercial pursuits may enter, and only missionaries or anthropological students are allowed in. This concerns the Central Australian portion. In the state of Western Australia any approved party may prospect upon establishing a bond of £100 to ensure fulfilment of the conditions laid down by the Protector.

During the expedition last year we reached the north-eastern corner of Lake Mackay, reported by the Mackay Aerial Expedition during flying operations from the Ehrenberg Range in 1930. The presence of this dry salt lake was first suspected by Carnegie, who saw signs of it in the mirage from his route. In 1904 an Afghan called Ramazan, after a dispute with his folk at Wiluna, left hurriedly with only one camel and did a remarkable solo trip right across to the Darwin-Adelaide telegraph line. He arrived south of Alice Springs and went to Oodnadatta. He reported a large freshwater lake just about where Lake Mackay has since been named. Later in 1925 Wyckham reported a similar discovery, but was discredited in the belief that he had mis-identified Lake Macdonald (Tietkins). We however were the first to reach the lake after Mackay saw it from the air and to bear out that it was substance and not mirage, as some were inclined to think. That Wyckham was there also before



Looking west towards Mount Singleton



Granite arch at Kunajarai



Mount Farewell (198 feet above plain) from the south-west



Camels drinking at typical "flat" rock hole, Surprise Hole

either of us is practically proved by a camel pad about eight to ten years old, which this year we noted coming in from and returning to the north at the mid-portion of the north end of the lake. It is most unlikely that any one except Wyckham had then been down there. The reported fresh water was probably due to an exceptional rain filling a part of the lake.

From the top of a high sandhill last year we sighted an unexpected and seemingly high new range beyond Lake Mackay. But the country was in a very dry state and our supplies were dangerously low, so, being not sure of water ahead (we have since learnt the range was then dry), we had to retreat to Mount Singleton, and reached there six days later with affairs in a very anxious state. We had been sixteen days without water and had done 250 miles without finding replenishment as all native supplies had only an insignificant residue, a few cupfuls of filthy soakage water.

Upon return this year matters were very different. Exceptional rains had fallen, and one of those rare good seasons, occurring, so it seems, about every seven years, greeted our return. O'Grady well at the Sandford Breakaways in its new condition is an excellent illustration of the change which occurred during our absence of about nine months. Last year at a depth of 35 feet we got a soakage of 1½ gallons per hour where the natives had followed the diminishing supply down a corkscrew shaft. This year the well was full up and we dipped buckets into an open pool 3 feet from the surface. For all practical purposes Surprise Rockhole was dry in August 1932; in May 1933 it held many hundred gallons of fresh water where the camels, kneeling on the rocky sides, could drink their fill. The lake itself had undergone change also, for whereas last time it was white on the surface, on this occasion the predominating colour was brown. From this we infer that during a dry time the salt is leached to the surface by ascending dampness which evaporates and deposits its saline content. During rains however this salt is redissolved and carried below, whence it returns gradually and coats once more the brownish-coloured matter consisting of stained gypsum and sand blown on to the lake surface by the winds.

On the same latitude as the north of the lake and just in Western Australia we reached the high range seen last year, and called it after Alec Ross, the last survivor of the exploration parties of Ernest Giles. It is a high narrow sandstone, ending abruptly at the western end but tapering gradually at the eastern end, in all extending almost due east and west for 10 miles. The eastern end of the high portion is 186 feet above its immediate northern base (by aneroid) and the western end 264 feet. It is much higher above its southern base. This feature is much more prominent than the heights indicate, for it caps ground which rises steadily from the lake and in all its crest must be about 600 feet above the usual level of the country, which hereabouts may be taken as 1400 feet above sea-level. Extending around the north and east of the range is a large old swamp area where dwarfed Morton Bay ash are generally distributed. Saltbush flats and claypans are numerous, and at the time of our visit an excellent variety of stock fodder was growing strongly—but one fears this may not be accepted as typical of the usual state of the district. About 12 miles north of the range there commences a wide area of highlands rising to about 200 feet above the old swamp. Here there is a strong development

of lateritic gravel and a few formations of secondary iron and silica exposed. There were some lignum swamps, and during three days' travel we noted twenty-six claypans and swamps carrying water whereon were duck. Several were as much as half a mile long, but of course the depth was inconsiderable owing to the nature of the catchment. They had however apparently been filled about two months prior to our arrival.

From the Alec Ross range we steered north-west until we reached a prominent bluff which is assumed to be the one marked by Carnegie as his first point south of the Stansmore Range. Here a cairn was built and a tin left with our names, this being the farthest west point of the expedition. From now on we pursued a zigzag course, averaging north-east towards The Granites, and in a few miles came to some high rounded quartzite ridges, remarkable in that east-west sandhills went straight across and over them with little or no sand on the rocks between them. Thus was it possible, by walking along the foot of the sandhill, to cross these stony barriers which otherwise would have been denied the camels because of the injury involved to their soft pads.

About 40 miles north-north-west of Lake Mackay we stumbled on the most remarkable area it has been my good fortune to find in this otherwise arid and at times fearful locality. During recent years information has been gathered pointing to an unusual place, according to natives, "many sleeps" north of the Transcontinental railway, east of Westralian settlement, west of Alice Springs, and south of Kimberley. We wonder therefore if such a place exists, whether we have found it.

Denudation has so far progressed in this hinterland to which we are giving concentrated attention on repeated excursions, that we have little hope of finding new features of any great altitude above the local contour. Optimism is centred upon something below the general level, that is, of basin character. Therefore it is satisfactory to have mapped in a portion of Hidden Basin and a source of no small regret that all of it could not be given attention owing to the apparent absence of minerals which demanded only a brief sojourn. We marched to this area by pure chance; it was hidden from Carnegie and Warburton by only a day or two's travel, and can be one of the few plums still remaining to be plucked by the latter-day traveller. Four or five miles away one has no inkling of its presence, and then quite suddenly there is a sharp drop in the country and below you lies a different terrain. Surrounded by sandstone cliffs up to 250 feet high, although more usually about 100 feet high, this basin must be about 40 miles by 20 miles—that is if the mirage did not seriously distort the distant views. About the centre are two new quite large salt lakes (dry then) into which creeks from the surrounding country empty. As a rule the bordering cliffs are of sheared flat-bedded sandstones, but in places they are sharply buckled and so give rise to numerous hills and valleys many of which are very picturesque. Pounds, that is, enclosed places, amongst the cliffs are frequent, and from such places, in two instances through narrow gorges, creeks issue on to the wide open bottom of the basin. So many are the features of this region that it would take a survey party many months to complete a topographical survey, which one may hope will be done when the border is surveyed for its entire length.

We entered the basin at the south end down a fairly wide sloping valley to

the floor which by aneroid is only 700 feet above sea-level. The smallness of this altitude has come as a surprise when the readings were worked out, for it is hard to believe that Hidden Basin is 600 feet below the level of Lake Mackay. But it may be so, for we experienced most unusually hot weather although it was winter at the time. Noon temperatures up to about 100° F. were regular, whereas out of the basin they dropped to no more than 80°. The first indication of fresh open water was when a large flight of corellas arose from some gum trees a mile east of the route. We detoured and found Brookman Waters, then six pools, the largest of which was 100 yards long, 30 feet wide, and 3 feet deep. The water, though slightly tainted with magnesia, was perfectly good for washing and drinking, and although only an hour before we had been anxious over water we now experienced the unexpected pleasure of swimming in a pool.

Northwards from Brookman Waters we travelled for 6 miles along the floor of the basin, averaging about 1 mile out from the bordering cliffs. The ground was practically bare and in many places covered thinly with rubble, much of which was weathered quartz, into which the camel pads made only a slight imprint and at times left no appreciable track. There are many places over the first 5 miles where an aeroplane would run no undue risk in making a landing, and would not have to alight more than a mile at the most from the waters we saw. It could taxi almost to the edge of the lowest pool at Brookman Waters.

Native tracks were numerous, but we saw nothing of them, for no doubt when earlier visitors to the camp had been sent away word had gone through the bush that we wished to be left alone. However for every water we found we were sure of twice the number within sight, as indicated by converging tracks. Gum trees along the creek banks are not so common as is usual: they are replaced by thickets of wattle and tea-tree, and at the time we saw them the former were in dense yellow blossom, a pretty sight, and the sweet scents that filled the air will never be forgotten. The creek beds contained a noticeably small amount of sand, and had shallow bottoms of red clayey material. As the tall big-leaved water wattle predominated along the banks we concluded that by sinking through this false bottom supplies of water will be obtainable even when the open pools have dried up. Water wattle is regarded as a sure sign of fresh water from 6 to 10 feet below the surface. I would not be afraid to return to the area whatever the season. Excellent camel feed of good general stock value was profuse along the creeks, but we must not suggest stock-raising possibilities in view of the good and probably abnormal season we had this year. All the same we found fresh tracks of wild cattle living there, and having tracked three found them to be large fat bullocks. Unfortunately the bullet which I put into one did not bring it down, so the camp missed the fresh beef which would have been such a delicacy after many weeks on unpleasant tinned meat.

Studying the basin as a whole we have come to the conclusion that the flat-bedded sandstones characteristic of the area have been subjected to a major downward faulting movement, from which we infer that the whole is a large subsidence area or collapse of that portion of the Earth's crust. This may be a rash conclusion, but it is at least one explanation of this curious region.

To the north-north-east of the main basin there lies Weston Basin, which seemed to us a separate feature. In it lies Lake White, but as Weston claimed his lake discovery there we are perpetuating his name by calling the basin after him. On the eastern flank of this basin is the Sydney Margaret Range (Weston), and here terraces on the eastern side of the range serve to indicate movement inasmuch as they show where the beds have slid upon each other. This feature is interesting, as flat-bedded sandstones extend west from its base for about a mile; they are then sharply sheared off and form part of the cliff of the basin proper.

Just south of this shelf is a narrow-mouthed pound, and south again another, whence a strong running stream of intensely salt water was flowing, about 30 feet wide, issuing on to an attenuated arm of the lake. Seeing that the late Sir Edgeworth David maps the desert artesian basin as stretching east to the Stansmore Range, we are inclined to suggest that this stream was not purely drainage from the pound but a leakage through strata carrying true artesian waters. This is partly supported by the pool of fresh water which we found at the head of the creek, about 3 miles above the running salt water which disappeared from sight shortly above the entrance to the pound. The low altitude of the basins and the supposed presence of artesian water lead us to believe that mound springs might be discovered in the region.

Dr. Fenner, in his book 'South Australia: a geographical study,' referring to tectonic movements, suggest that a major "shatter zone" may continue from South Australia right through to the King Leopold and allied ranges in the Kimberleys. This would place Hidden and Weston Basins more or less on the line of weakness, although somewhat west of the line which he suggests may pass close to Tanami. When I discussed the subsidence theory with him, he was keen to know of any evidence of block faulting, and I could recall no such feature. The fact however that a disturbed line of this character is supposed to run through the continent may be taken as a general support to the conclusion we have above indicated.

The author has sent to the Society detailed appendices on soils, natural history specimens, determination of heights by aneroid, and meteorological conditions during the expeditions of 1932 and 1933. These are too long for publication in the Journal, but will be preserved in the Library where they may be seen on application to the Librarian.—ED. G. J.

THE MACKAY AERIAL SURVEY EXPEDITION, CENTRAL AUSTRALIA, MAY-JUNE 1930

DONALD MACKAY

IN writing a report of the Mackay Aerial Survey Expedition in Central Australia, May-June 1930, there is little to be said, since the reconnaissance map compiled by Commander H. Bennett with aerial photographs that accompany it¹ show at a glance the object of the expedition and work accomplished.

Before the start of the expedition it was necessary to make arrangements to have an aerodrome cleared at the proposed base at Ehrenberg Range, and on April 26 R. Buck, five natives, and eight camels were dispatched from Alice Springs for this purpose with orders to keep smoke signals going on May 26 and the following days until we arrived. The area of the aerodrome was to be 700 yards square. Provisions, spare parts for aeroplanes and camp equipment were forwarded on April 24 from Melbourne to Alice Springs, where arrangements had been made with Ali Muhammad to carry these, also the Shell spirit and oil to be used on survey flights which had to be transported by a team of sixty camels to our proposed base at Ehrenberg Range. The total weight of loading was 11 tons 8 cwt. I am much indebted to Captain H. Larkin for the assistance he gave me in making these arrangements, and to Mr. Allchurch, P.M. Alice Springs, while later on I received much kindness and assistance from the Rev. and Mrs. Albreach, Finke Mission.

The personnel of the expedition were: Frank Neale, pilot (Love Bird); Hussey, second pilot (Diamond Bird); Commander H. Bennett, navigator and surveyor; H. Kingsley Love, wireless; P. Crosbie Morrison, representing the *Melbourne Argus*; and Donald Mackay, leader.

On May 23 the members of the expedition were entertained at lunch by the Prime Minister, Mr. Scullin, at Parliament House, Canberra, and at 10 a.m. on the morning of the 24th the expedition left Canberra, reaching Mildura the same afternoon, Oodnadatta the following afternoon, and on the third day Hermannsburg Mission on the Finke River. On arrival I was disappointed to find that through a mistake a supply of petrol had not been left here. This necessitated flying to Alice Springs on the following day. I ordered the necessary benzine and oil and returned to the Mission in the afternoon. Mr. Wilkinson, Shell agent, on hearing of the mistake at once sent the necessary supplies by motor lorry to Hermannsburg, 85 miles.

On the 28th at 10 a.m. I left to locate the base camp, Hussey and Morrison remaining at the Mission, and Morrison keeping in touch by wireless with Love, who was in our plane. At 11.40 Neale notified us that he had sighted smoke. At 12.15 Neale made a perfect landing at Ilbilla. We were met by Buck and Ali Muhammad, the latter having arrived on the 24th with stores, etc. At 3 p.m. the plane returned to Hermannsburg taking some spares. Bennett and Love also returned, while I remained to open up cases and to have final touches put to camp.

¹ Unfortunately the aerial photographs have not been received by the Society.—
Ed. G. J.

The camp was situated about half a mile from the Ehrenberg Range and $1\frac{1}{2}$ miles from a soak that occurs in a tea-tree gully: the only water probably within a radius of 100 miles. The supply was limited but ample for our requirements and those of the local natives and Buck's camels. The aerodrome, which is 700 yards square, is a safe landing-ground, though bumpy in parts, its surface thickly studded with Bendi eye burrs which on several occasions punctured our tyres. The absence of well-grown timber is very noticeable in this locality, also west and north-west from here; I was unable to find a tree of sufficient size on which to mark the date, etc., of the expedition. Bird and animal life are scarce; there are a few euros and small wallabies in the ranges; during our stay we saw quite a number of zebra finches, two crows, one hawk, and two wagtails. Flies were very numerous and caused considerable inconvenience.

On the 29th the planes returned filled up with benzine and oil in readiness for a start on the morrow. But for the next two days flying was out of the question, there being a strong cold southerly wind which would have caused too much drift for Bennett to do accurate work. So the time was spent in climbing the range and fixing up a motor bike which had been brought to drive a dynamo for generating current for the wireless. One piston soon collapsed, and although Neale had it running for a time on one cylinder, it was scrapped and the hand generator had to be relied on. On the 30th Ali Muhammad left with his camel team for Alice Springs. On June 1 we left for Ayers Rock. Neale made a successful landing some 2 miles north-west of the Rock. Sickness unfortunately robbed the expedition of a lot of useful work that might have been done. Some 1200 miles had to be flown in taking members of the expedition who were stricken with dysentery to the Mission Station and Hospital at Alice Springs, Bennett, Hussey, and Love being the victims. Fortunately there was sufficient benzine to complete the survey, but none to visit several auriferous belts of country I had hoped to inspect. In fact when the planes left Ilbpilla on the home run Ayers Rock—Cook, there were only six drums of benzine not used.

Having had a very varied experience as regards transport in exploration work, on foot in Papua, camel train in Central Australia, pack-horses in Arnhem Land, and this latest trip by aeroplane, I consider the last ideal for survey work. Still it has its drawbacks: the trouble of finding suitable landing-grounds, 600 or 700 yards being necessary, and the risk of soft patches and anthills; unlike North Australia, where they are high and easily seen, here they vary from 1 foot to 18 inches in height, often hidden in clumps of spinifex. Striking one of these would probably break the undercarriage. In the event of a forced landing in sandhill country successfully made, after rectifying engine trouble, it might take a month to be in the air again, for a trench 600 yards would have to be cut and filled with spinifex, then packed with sand to make a run-away. This would be a big undertaking, as there would probably be no water within 50 to 100 miles. The ideal expedition would combine aeroplane and camel, the plane to do the survey work, the ground party to examine the country rock, flora and fauna, and to locate rock-holes not discernible from the air.

In my 1926 expedition I found the cruising speed of the camel $2\frac{1}{2}$ miles

an hour, and with necessary halts I was sometimes unable to maintain this average. Following along ranges where I could only conjecture what might be on the other side, I had to halt the team and climb the range, in many cases from 600 to 800 feet high above the plain, carrying theodolite and instruments; and as these hills are mostly granite or quartzite and often precipitous the work was slow and arduous. With the aeroplane one sees both sides of the range at the same time, also water that a ground party might pass close to and not see.

Possibilities of development in Central Australia

One might sum up these under three headings: Pastoral, Mineral, and Tourist.

If one was to ask the average Australian his opinion of Central Australia he would unhesitatingly say "desert." This would certainly be incorrect, though the area lying west of Lake Macdonald in West Australia might come under that heading. With this exception the remainder of the country flown over showed a good growth of mulga and spinifex, and if water could be obtained in sufficient quantities, would carry stock. Under the present depressed pastoral conditions this country is of little value, but when prosperity returns I hope to find that the Government will give the Central Australian pioneers sympathetic treatment. The only hope to combat the adverse conditions of the interior is that men should get big areas under the improvement lease system, free of rent for, say, thirty years, the improvements to consist of a stipulated number of wells to be put down each year.

As regards mining, there are great possibilities, though prospecting will be somewhat difficult on account of the shortage of water. I have been on most of the goldfields of Australia and had considerable practical experience in gold and opal mining, but have never seen more likely looking country for minerals than I have seen in Central Australia. Even if the parties who are at present out prospecting do not succeed I feel confident that sooner or later an eldorado will be found in this country.

From a health and tourist standpoint Alice Springs with its picturesque surroundings is attractive: a perfect winter climate, clear days, cool to frosty nights. By car there is much to be seen in the Macdonnell Ranges: Palm valley in the James Range and Hermannsburg Mission. Then in the southern portion of Central Australia there is Ayers Rock, the latest world's wonder which the aeroplane has brought within reach of the tourist who will certainly make it his mecca in Australia. From here one can fly over Lake Amadeus, Mount Alga, and the Petermann Range, all these being of unusual interest.

Natives

Such terms as "hostile natives," "savages," which I have seen in print should not be applied to the natives. Handled in the right way and kept out of one's camp they are certainly a help, not a danger or menace to travellers. Our planes were always left some 200 yards from the camp at Ilbilla, in the cabin were emergency rations and other goods; but although there were some thirty natives camped in the locality nothing was ever stolen.

The estimate that in Central Australia and Arnhem Land there are over 20,000 natives is, I feel sure, greatly exaggerated; Central Australia with its

drought conditions could never support a big population. I have seldom found more than thirty in a tribe, though if a corroboree is being held one might see several hundred.

New names appearing on the map

There are several features appearing on the map accompanying this report which are unnamed. Commander Bennett has availed himself of the surveyor's privilege to name several features. He originally named a small salt lake in West Australia after Captain F. Neale, but considering the splendid work done by Neale I altered this to a more conspicuous lake north-west of Lake Amadeus and called the lake in West Australia Orantjugurr, after the chief of the Pinto tribe. I have also called a lake after Commander Bennett. Being unable to obtain local native names we decided not to name any other features. Members of the expedition were anxious to call the big lake discovered on the West Australian border Lake Mackay, but I decided to leave this to the discretion of the Commonwealth Government. The local name is Ipagnya.

During this trip of more than 10,000 miles' air travel we had not one forced landing, which proves the reliability of the Armstrong-Siddeley "Jaguar" 485 h.p. Radial engine used. I also realize that Captain Frank Neale was a big factor in attaining this result; he is a pilot who left nothing to chance, and I can realize how he has attained the wonderful record of 7000 hours' flying without an accident. Commander H. Bennett lived up to his naval reputation, though during quite a considerable portion of the time he was in indifferent health. He never missed an opportunity of taking observation early or late. H. Kingsley Love, as wireless expert, did excellent work, though handicapped by having to leave Melbourne with an emergency receiving and sending set; the set he had specially made for the trip had been put out of action when the three-engine machine Lasconder had a landing accident after a flight over Melbourne which was made to test his instruments. Mr. P. Morrison, of the *Melbourne Argus*, gave much valuable assistance in receiving messages at the base camp. In fact the only weak link in the whole traverse was the unfortunate illness of some of the members.

ALFRED WEGENER'S GREENLAND EXPEDITIONS
1929 AND 1930-31

WISSENSCHAFTLICHE ERGEBNISSE DER DEUTSCHEN GRÖN-
land Expedition Alfred Wegener 1929 und 1930-1931. Band I: Geschichte
der Expedition. By KURT WEGENER. *Leipzig: Brockhaus* 1933. 11×6¹/₂
inches; xii+198 pages; illustrations and maps. M.17.30. Band II: Seismik. By
BERNHARD BROCKAMP, ERNST SORGE, and KURT WÖLCKEN. *Leipzig: Brockhaus*
1933. 11×6¹/₂ inches; 160 pages; illustrations. M.15.50. Band VI: Anthro-
pologie und Zoologie. By HERMANN B. PETERS. *Leipzig: Brockhaus* 1933.
11×6¹/₂ inches; viii+196 pages; illustrations and sketch-maps. M.17.30

ALFRED WEGENERS LETZTE GRÖNLANDFAHRT. Unter Mitwir-
kung von Dr. FRITZ LOEWE herausgegeben von ELSE WEGENER. With an
Introduction by KURT WEGENER. *Leipzig: Brockhaus* 1932. 10×6 inches;
304 pages; illustrations and maps. M.8

IM EIS VERGRABEN. By JOHANNES GEORGI. With an Introduction by
EJNAR MIKKELSEN. *München: Verlag des Blodigschen Alpenkalenders Paul
Müller* 1934. 8¹/₂×6 inches; 224 pages; illustrations and map. M.3.50

"THE time has come to replace adventurous record-journeys by serious
scientific investigation," observed Alfred Wegener in the first plan for
his expedition. Presumably this was rather a justification for a new style of
expedition than a belittlement of the work of those, himself included, who had
already crossed Greenland. Wegener as much as anybody had shown that an
intelligent man with hardly any more equipment than the traditional aneroid
and sling-thermometer could bring back a booty of highly stimulating observa-
tions. Wegener was now to attempt to overstep the limits which the earlier
travellers had set themselves; the inland-ice was to be his field of work, not a
desert to be crossed as quickly as possible.

The crossing of Greenland in 1912 with Captain J. P. Koch was the final stage
of an expedition which set out to solve some of the problems left open by
the *Danmark* Expedition of 1907-8. Wegener had joined that expedition as
meteorologist. But academically he was an astronomer, and this training brought
him into contact with the expedition's astronomer, J. P. Koch, with whom he
discussed a great deal, discussion waxing particularly intense over certain dis-
crepancies in the longitude observations in North-East Greenland, which
suggested the theory of continental drift.¹ This theory later brought Wegener's
name before a considerable public. The greater part of Wegener's subsequent
work was however meteorology, although the important work carried out in
1912 on a glacier flowing from the inland-ice establishes him as a glaciologist.
The main lines of Wegener's interests were linked with Greenland, and it is
hardly surprising that he had for a long time held hopes of making another
expedition to Greenland with J. P. Koch. But first the war, then the illness and
death of Captain Koch quashed these plans.

The impulse which finally brought the German Greenland Expeditions into
existence came from Professor Meinardus, who had proposed in 1925 that
certain geophysical methods in process of development at the Göttingen Geo-
physical Institute should be used to find the thickness of the Greenland ice-cap.
By 1928 the specialists under Wiechert had brought the technique of echo-
sounding so far that Professor Meinardus was able to propose Wegener as leader
of a German expedition to Greenland.

¹ See J. P. Koch, "The Survey of North-East Greenland," *Meddelelser om Grønland*,
vol. xlv.

Wegener's own interests were centred round the interplay of ice and weather. To use his own phrase, "glaciological and meteorological observations should go hand in hand." The plan of work was soon prepared and as soon accepted by the *Notgemeinschaft der Deutschen Wissenschaft*. It differed from the plans of former expeditions in the boldness of the projected transport operations and in the large number of scientific specialists it would include. Specialists bring disruptive forces into an expedition: the less experienced scientist cannot see the interests of the expedition as a whole, but tends to concentrate on his own idea of his own work and is unwilling to sacrifice time and strength to the work of another faculty. Thus the first concept of the expedition challenged sources of difficulty which previous expeditions had avoided.

The full list of Wegener's strong team of scientists, twenty-two in number, can hardly be cited here *in extenso*. But it should be mentioned that Dr. Georgi had already made a plan for an aerological expedition to work in Nualik, between Angmagssalik and Kangerdlugssuak in East Greenland. Nualik is a thoroughly inaccessible spot, surrounded by rocks and generally blocked by ice. By the fusion of Georgi's expedition with Wegener's both expeditions gained.

The final programme of the expedition comprised three stations lying on the 71st parallel: in West Greenland, in the middle of the inland-ice, and in East Greenland (Scoresby Sound). Wegener classified the work before the expedition in the following order: (1) ice-sounding; (2) an instrumental levelling along the ice-profile; (3) gravity survey; (4) ice-borings; (5) glacier motion; (6) the erection of a station on the inland-ice.

The transport problem which corresponded with this programme was fantastic. No less than 120 tons of goods had to be lifted from sea-level to the level of the inland-ice, some 3000 feet. Of this, at least 3½ tons had to be carried 250 miles to the projected ice-cap station, "Eismitte," which lay over 9000 feet above sea-level. For the first part of this task a number of Iceland ponies and some Icelanders were fetched from Reykjavik: the group was under the leadership of Vigfus Sigurðsson, who had crossed Greenland with Wegener and Koch in 1912. Another old expedition comrade who helped Wegener in 1930 as coast-pilot was Tobias Gabrielsen, one of the Greenlanders from the *Danmark Expedition*. He was then fifty years old. Tobias is a man of some standing in West Greenland by reason of his wide travels. In 1914 he was in Hamburg as member of an Austrian expedition which should have sailed for the Antarctic. But the war broke out and Tobias went through the experience of being arrested as a Japanese spy.

For the transport over the ice it was intended to use two motor sledges. A way up on to the ice had been reconnoitred during a preliminary expedition to Disko Bight in 1929. But even the approach by sea to the chosen glacier in Kamarujuk was by no means easy in 1930. The expedition went up with the motor-ship *Disko* as far as Holstensborg, where on April 20 goods and personnel were transhipped to the ice-vessel *Gustav Holm*. The winter-ice broke up late in the spring of 1930, and there was no chance of getting in to Kamarujuk, so everything had to be landed on the ice some miles to seaward of the settlement Uvkusigsat. By May 8 all the goods had been brought ashore at Uvkusigsat by sledge, while the two motor-sledges had been rushed in to Kamarujuk over the melting ice in the fjord. As the motors were not yet mounted each sledge had to be pulled by two spans of dogs. There followed one of those dreadful pauses of enforced idleness, waiting for the bridge of sea-ice to break up. At length, on June 13, it was possible to attempt to continue the journey on the schooner *Hvidfisken*, and on the 17th, much later than Wegener had hoped, the expedition was deposited at the foot of the glacier.

It was hard labour for all hands and the horses to bring the 100 tons or so of baggage up the glacier. An ice-fall in the middle of the glacier was so bad and the delay caused by it so nearly disastrous that drastic measures had to be taken. Attempts to engineer a way through the crevassed region had failed and the only possibility left was to build a mountain path along the moraine. This saved the situation as far as the goods were concerned. But the motor-sledges could not be taken up as pack-loads on the ponies. Hauling them up, partly by hand-winch, took six weeks, and although they were up and the mounting of the engines begun on August 9, it was too late. By the time the mounting was finished, test-runs made and fuel-depots laid out, it was September 20, and winter conditions had begun. The journey to Eismitte had to be given up.

Fortunately Eismitte, the inland-ice station 250 miles inland, had been occupied by a journey begun in July. By mid-September three big dog-sledge journeys thither had been made, and during these journeys 3½ tons of goods had been brought there. But unfortunately the occupants had relied on further supplies being brought by the motor-sledges and now found themselves with much of their scientific apparatus but only about half of the previously calculated amount of winter fuel. Wegener knew this and had also suspected that the motor-sledges would not be able to make the journey. On September 21 he began a journey to Eismitte with Loewe and fifteen sledges. The Greenlanders were assembled at the last moment: they were for the most part older than one would otherwise have chosen. The journey was a grim one. On the second day out they met the motor-sledges as they were about to be abandoned for the winter by their crews. On the seventh day, 40 miles from the start, eight Greenlanders, whose equipment was certainly hardly suitable for a winter tour, refused to go any further. At 100 miles from the start three more were sent back, so that with Loewe and the Greenlander Rasmus Willumsen it was a party of three that continued under bad travelling conditions, *i.e.* the short day, continual storms, cold, and new snow. The ice-cap station was reached on October 30.

Wegener had of course brought no useful load with him. He was accompanied by Loewe, whose frost-bitten feet made it necessary for him to remain in Eismitte. Further, the returning party would have to be provisioned thence. These two circumstances could possibly make things more difficult for the group wintering at the ice-cap station. But Wegener had had urgent reasons for continuing the journey: firstly, to make sure that the station would be occupied, since he was prepared to winter with Loewe, on the short ration of 1·3 litre paraffin per day (Courtauld used 0·7 litre per day (*Polar Record*, No. 4, 1932)). Secondly he had to supply Georgi and Sorge with dog-sledges should they, as stated definitely in their letter which Wegener had received at the outset of his journey, have left their station on October 20. (Their plan had been to travel back to the coast with hand-sledges unless they received a considerable quantity of paraffin and some other goods before October 20.) Thirdly he had to eliminate the very great anxiety which would arise if Georgi and Sorge, having sent this letter, decided nevertheless to remain at Eismitte and therefore failed to reach the coast after a reasonable period of time.

But Georgi and Sorge had actually decided to stay where they were; they had made themselves as comfortable as they could in the absence of the tent-house which should have been brought by the motor-sledge by building a dug-out in the *névé*. Since there was no question of five men spending the winter at the station, Wegener and Rasmus started the return journey on November 1, Wegener's fiftieth birthday. The West Station had meanwhile sent out a relief expedition led by Weiken and Kraus which remained at a point 40 miles from the coast until the first week in December, when they were obliged to retire, having failed to meet Wegener.

The party at the ice-cap station survived the winter and carried out a full and creditable programme of observations; they were well supplied with food and never so short of fuel and light as was Courtauld. (Presumably the estimate of 4 litres of paraffin per day which led to the letter forecasting their abandonment of the station was based on the idea that photographs would be developed and hydrogen for the sounding balloons generated all the winter.) Their relief arrived by motor-sledge on May 7, two days after Watkins had relieved Courtauld, when for the first time the fact of Wegener's death could be definitely established.

The scientific results of the expedition are to be published in six volumes, of which three are now available. The same format as that of "Meddelelser om Grønland" has been deliberately chosen. The type and the general lay-out is pleasing and the volumes are richly illustrated with photographs and figures. The *General Account*, *Ice-Sounding* (entitled *Seismology*), and *Anthropology* have been published, but *Glaciology*, *Meteorology*, and *Geodesy* are still in preparation.

The first volume contains accounts indispensable to any organiser of a future expedition with a scientific programme. (Wegener wrote in his diary, "What we are doing now is the South Pole exploration of the future.") The transport problem is thoroughly analysed by Professor Kurt Wegener, although the problem of the reduction of the loads which individual specialists may consider necessary is not discussed. The section on wireless, though technically already out of date, states that communication can be kept up day and night over long distances (e.g. from Eismitte to the coast) with very low power (e.g. 2 watts) using a wave-length of 50 metres. This is supported by the experience of Danish expeditions in Greenland, which found the 50-metre wave equally suitable for long and short distances, even in deep fjords where the screening for longer waves was complete.

But inevitably the most interesting report in the first volume¹ is that by Dipl. Ing. Curt Schif on the motor-sledges, or, more properly, propeller sledges. It was Wegener's conviction, after the many experiments which had been made with tractors in Polar regions, that the load-bearing member should not be identical with the driving member. The driving wheel of a tractor sinks in snow and before long the machine is hopelessly stranded. The propeller sledges had skis and an air-screw driven by a 112-h.p. motor. It was an investigation of some importance to try these contrivances out in Greenland. Any brief summary of the results must admit at the outset that they were worse off than a dog-sledge in crevassed districts, on slopes, in a head wind, or in soft snow. Moreover starting was always difficult, since the skis tended to stick in the snow. In the ideal conditions when they were superior to dog-sledges, i.e. where there was a hard surface in fine weather on the central part of the inland-ice, they were very much superior. The useful load, apart from the crew of two and their emergency equipment, was then 1200 lb. and a speed of 20-25 miles per hour could be kept up. During such a run they would be using less fuel per unit of useful load than a dog-sledge would use under the same circumstances and travel could be continued during the summer night without tiring the crew overmuch. A further advantage of the fuel-burning sledge is that halts can be made for scientific work without the loss that is incurred by having to feed a dog-team which is not doing any work.

¹ The observations on the accumulation and melting of snow have been deliberately left for discussion in connection with the meteorological results.

The sledges' real field of usefulness is on the ice beyond the coastal zone of comparatively steep gradients and frequent crevasses. Schif works out a timetable for the combined operations of a motor-sledge and dog teams. He assumes two trips with ten sledges occupying twelve days in which $2\frac{1}{2}$ tons of useful load and $2\frac{1}{2}$ tons of petrol and supplies are brought over the 60-miles'-wide coastal zone. One motor-sledge can now bring the $2\frac{1}{2}$ tons of useful load to a point a further 200 miles inland in the course of a further sixteen days. Finally he argues that by using a larger air-screw and a rather more powerful motor both better performance and lower fuel consumption would be possible. It seems that the problem of the design of a motor-sledge is not incapable of solution. But it is a severe handicap for an expedition to have to spend time and energy on developing a new transport type, while to rely on the untried factor is to court such disaster as this expedition met, or worse.

The second volume, the ice-seismology, has been elaborated by Brockamp and Wölcken into a very useful text-book which, apart from the wave equations, would be quite intelligible to an interested non-expert with an elementary knowledge of German. It should not be supposed that to measure a thickness of ice by echo-sounding is as simple an operation as echo-sounding at sea, even if one could postulate an ideal set of conditions in which the ice were a homogeneous medium and its upper and lower surfaces parallel planes. Assume for the sake of argument a perfect explosion at the surface of a perfect inland-ice. The consequence is the radiation of a family of different kinds of waves. At sea, one was concerned only with the longitudinal sound-waves which, after reflection from the bottom, were picked up at the source of disturbance. But in ice, since it is a solid medium, both longitudinal and transverse waves are generated. The seismograph on the ice, which perforce cannot be erected at the seat of the explosion, records everything which arrives. The waves arriving may be the longitudinal waves which have travelled near the surface, or the transverse waves which have travelled the same way; they may be boundary waves along the upper surface of the ice; they may be longitudinal waves which have been refracted into the rock below and out again into the ice, or transverse waves which have taken the same path; they may be transverse waves generated at the point of reflection of the longitudinal wave. A further set of waves is probably set up vertically below the explosion. At some time the sound-wave through the air will add its disturbance to the already confused record.

Even under ideal conditions it is therefore necessary to analyse the wave system by means of a series of stations. A row of seismographs recording a single explosion would not be practicable; so a series of explosions is made at increasing distances from a fixed station. Further assistance in disentangling the records is obtained by recording the vertical and horizontal components on separate seismographs, whose records are combined on a single strip of film. Practical conditions differ from the ideal conditions postulated in that on the one hand the ice may change its physical characteristics gradually or in steps; while on the other the land under the ice may have any sort of relief, though gentle undulations would be the most probable.

By skilful reading of the records not only the depth of the ice but also the rate of propagation of the waves at various depths is obtained. The criteria of good recording are discussed in an "Ergänzende Untersuchung." The points made are, firstly, that the travel-time-curve for the reflected wave should be a hyperbola; secondly, that the amplitude of the reflected wave should increase relatively to that of the direct wave with increasing distance until the angle of total reflection is reached; thirdly, that the frequency of the direct and reflected waves should be identical. These are small points but important.

The results reached by the West Station group are very fine and complete. Soundings were made at nine stations, and it was unfortunate that circumstances prevented the party from travelling more than 75 miles towards Eismitte. But the station at 75 miles was one of the best; twenty-two explosions were made, and it has been possible to produce a contoured map of the land under the ice in the neighbourhood. The thickness of the ice was here 6000 feet. The travel-time curves gave the surprising result of a layered structure of the ice, a result also given by the station 40 miles from the coast. These results are given as sudden increases in the rate of propagation from one layer to another. One would expect the process of the settling of the névé and its transformation into ice to be gradual and continuous. This contention is supported by the temperature and density readings in the shaft dug in Eismitte. But the thermodynamical balance of the inland-ice is still unknown, and all one can say for the present is that the seismic approach to the problem is likely to be a profitable one.

The work at Eismitte was done at the very end of the expedition, in the last week of July and the first days of August 1931. Half the equipment had been there all the winter and the rest was brought by the motor-sledge which was to relieve the station. (This, the second trip to the ice-cap station in the year, had been much delayed by the repairs which had to be made after the first trip. Nevertheless, the motor-sledge, once there, helped the work at the station enormously.) Between July 29 and August 5 twenty-eight explosions were made, with charges varying from a few detonation-caps to 150 lb. of T.N.T.

Sorge's records are typified by an insensitivity of the horizontal seismograph and an instability of the vertical, on whose records the echoes must be looked for. Sorge had been obliged to dismount the damping units, with the result that the instrument continually broke into oscillation as a result of wind or some similar disturbance. Even the arrival of the longitudinal waves is in many cases anything but clear. This is in strong contrast to the records of the West Station party, whose records (all records discussed are reproduced) are sharp even at the extreme distances and depths (cf. Seismogram IX, 18). There is not a single record from Eismitte in which the arrival of the reflected wave is convincingly clear. In all, Sorge only takes four records up for discussion of the presence of a reflection record. These seismograms are Nos. 9, 10, 17, 28. No. 28 was the "big bang" with 150 lb. of T.N.T. at 4 kilometres.

In the preliminary report (Else Wegener, p. 213) he writes of No. 28, "later when the film was developed reflected waves were so good as certainly to be seen" ("so gut wie sicher zu sehen waren"). The preliminary calculation, continues Sorge, gave the result: in the centre of Greenland the inland-ice is 2500-2700 metres thick. The same value is published in the special Alfred Wegener number of the *Zeitschrift der Gesellschaft für Erdkunde zu Berlin* (1932, No. 3/4). But the uncertainty of the reading of these records is shown by the different interpretation made in Vol. II of the scientific publications. Here Nos. 9 and 10 are accepted as the most trustworthy seismograms. ("Somit stützt sich die Eisdickenbestimmung in Eismitte wesentlich auf die beiden Registrierungen Nr. 9 und 10.") During this consideration No. 28 is only taken as a control; but this time a different point has been read for the entry of the reflected wave, a reading which gives a depth of 2050 metres.

If now the claim for identification of reflected waves in the seismograms 9 and 10 be critically examined, it will be found to be based on the recognition of a high-frequency movement superimposed on the otherwise disturbed record. But Sorge himself says that such a high-frequency movement was observed before and after the explosion No. 9. To these phenomena Sorge makes the remark, "Diese stellen Bodenunruhe dar." Further examination of

the matter shows also the following relations: in both cases 600 gms. of explosive were used, the distance between explosion and seismograph was 1000 metres, and the assumed depth 2000 metres. Now Brockamp and Wölcken in ice 1800 metres thick at their station at 76 miles let off 25,000 gms. of explosive at the same distance; assuming that Brockamp's instrument had had the same amplification as Sorge's, the amplitude of the reflected wave was 1 mm. (cf. Vol. II, p. 107. Brockamp's magnification was in fact 24,000 and the amplitude 0.5 mm.). Sorge was therefore working in a greater depth of ice with one-fortieth of the energy; furthermore the greater depth of the névé at the ice-cap station would probably absorb more of the energy of the reflected wave. In these circumstances a reasonable doubt is thrown on the validity even of the results obtained from explosions 9 and 10; it is hardly possible that the amplitude of the reflected wave from a 600-gm. explosion would be great enough to be recorded. The fact that no reflection was obtained from the big explosion No. 28 may indeed be an indication that a much more irregular profile exists under Eismitte than under the station at 75 miles. But as they stand the results of the ice-sounding at Eismitte do not appear to be such as can be presented by the expedition as one of its principal achievements.

The popular accounts of the work of the expedition can be referred to briefly in conclusion. Frau Wegener's and Dr. Loewe's presentation of the first-hand experiences of most of the members of the expedition suffers from the fact that each contributor had to write without knowledge of the reports written by the others. This has led to a certain amount of overlapping, to much description of the elementary aspects of arctic work, and to a confusion of styles, which vary from the conversational to the strictly scientific. But the main features of the expedition are recognizable throughout and the extracts given from Wegener's diary and letters make the book a necessary appendix to the scientific results.

Dr. Georgi's book, on the other hand, is not so happy in its achievement. On the disinterested reader the undercurrent of polemic will produce quite the opposite effect to that intended by the author. Professor Kurt Wegener's report on the expedition was written strictly in the spirit of the words of Dr. Schmidt-Ott, the President of the *Notgemeinschaft der Deutschen Wissenschaft*, "that no person can be held responsible for the death of Alfred Wegener." The report described the events of the expedition in their slow sequence, circumstance piled on circumstance, with almost Sophoclean effect, and the climax of Wegener's unwitnessed death is inevitable and impersonal. If Dr. Georgi still thinks that any one believes that the burden of the tragedy rests upon him, then he would have done better to let the account as published by Kurt Wegener speak for him than to publish this book two years later.

MICHAEL SPENDER

The anthropological and ethnographical studies are restricted to the East Station in Scoresby Sound, where they were carried out by Dr. Hermann B. Peters. The volume of results contains three sections: viz. an introduction by Dr. Peters on the somatology of the Angmagssalik Eskimos, to which Dr. Wolfgang Abel has added a section on the patterns of the lines of the hand and Dr. Heinrich Kranz some studies of the hair of the Eskimos; remarks on the former Eskimo colonization of Scoresby Sound with accompanying sections by Dr. Kranz (skeleton material) and Dr. K. Th. Preuss (archaeological specimens); and finally a zoological section with a general account of the fauna of the region of the expedition and special sections on parasitic worms and the bacteria present in the alimentary canals of polar animals. Many of these

studies make valuable additions to our knowledge. Thus, hand patterns have not previously been studied in Greenland and the results obtained are very interesting. In this matter the East Greenlanders show considerable similarity to both Ainos and Japanese as well as to Europeans, but less to Koreans; while they differ greatly from the American Indians and Chinese.

In his introductory chapter Dr. Peters seems to have neglected some recent studies of the archaeology of the Angmagssalik Eskimos.

THEKEL MATHIASSEN

REVIEWS

EUROPE

THE PILOT'S GUIDE TO THE THAMES ESTUARY AND THE Norfolk Broads, for Yachtsmen. By W. ERIC WILSON. *London: Imray, Laurie, Norie and Wilson* (1934). 10 × 6 inches; x + 394 pages; illustrations and charts. 12s 6d

This guide, published by the famous firm Imray, Laurie, Norie, and Wilson, is intended primarily for yachtsmen, but it will become a most valuable aid to all who navigate the intricate channels of the Estuary. It is more than a pilot's guide. There is a historical introduction to the sands based on a series of articles in the *Mariner's Mirror* that have already been reviewed in this *Journal*. There is an excellent series of photographs taken from the air which will enable the stranger to visualize the topography of the port he is approaching; an outstanding photograph is that of West Mersea at low water. There are other photographs which convey to the pilot a better idea of the landfall than any written description. A useful summary of the byelaws of the Port of London Authority is a welcome addition and will be of great value to the owner who wishes to go above bridges. The East Coast yachtsmen will find the charts and directions for the Barrow and Knock John Swathways a valuable guide for light-draught craft making cross-estuary passages from the Essex rivers. Mr. Wilson gives no help to the foolhardy who would attempt to enter the River Ore at Shingle Street without a pilot; on the other hand, he gives sufficient details to enable the yachtsman to enter Woodbridge Haven under favourable conditions of tide and weather. He introduces the lover of quaint backwaters to Walton, and rightly praises the Walton and Frinton Yacht Club for their enterprise in buoying the channel. The charts are clear and devoid of confusing detail; and there are useful chapters on elementary navigation, details of tides, lists of places where stores can be obtained, and of train services for the week-end yachtsman.

H. M. E.

THE CATHEDRALS OF ENGLAND. By HARRY BATSFORD and CHARLES FRV. With a foreword by HUGH WALPOLE. *London: B. T. Batsford, Ltd.* 1934. 8½ × 5½ inches; x + 118 pages; illustrated from drawings by BRIAN COOK and from photographs; sketch-map inside front cover; illustration of architectural terms and plan of a typical cathedral inside end cover. 7s 6d

After a brief introduction the authors deal with the twenty-six major cathedrals in turn, add short notices of thirteen parish-church cathedrals, and give a final page to three modern cathedrals—Truro built, Liverpool building, and Guildford to be built. They claim that their book illustrates the cathedrals with all the resources of modern photography. This has been more successful with

interior than with exterior views, some of which are strangely hard and unreal, especially that which makes Canterbury look like a model in white sugar against a dark backcloth. More of the distant glimpses, like those of Salisbury soaring from the water-meadows and of Wells snuggling down against the Mendips, would have been welcome. The sketches in the text are undistinguished. Much more valuable are the ground-plans on a uniform scale of 100 feet to an inch. With the aid of these we can compare the simplicity of York with the complexity of Canterbury, and can discover that the whole of Ripon is equalled in length by the nave of St. Albans. We can also convict the text of blunders, first in giving that nave 550 feet—actually the length of the whole church—and then in putting it second to Winchester's nave, which is called the longest in Europe, when again it is possibly the whole church but not the nave that can claim that distinction. A reviewer elsewhere has already pointed out certain historical inaccuracies that should be corrected in a new edition; to these may be added the slip "Ethelred" for "Ethelbert" in the account of Hereford. Architecturally the authors are well informed, being evidently disciples of the late Professor Prior, whom they follow in employing the spellings "quire" and "molding." They are justly severe on the damage done in so many of our great churches through what they call "a portentous purification by some eminent church architect in the 'sixties or 'seventies." Compared with the cold-blooded destructiveness of Wyatt, Scott, and Grimthorpe, the passionate iconoclasm of Reformers and Puritans almost demands sympathy.

J. H. R.

SAAR-ATLAS, im Auftrage der Saar-Forschungsgemeinschaft bearbeitet und herausgegeben von HERMANN OVERBECK und GEORG WILHELM SANTE. *Götha: Justus Perthes 1934. 15½ × 9 inches; pages 104 (text), x (illustrations), and 40 (maps). M.12*

The present political interest in the Saar should give this atlas a very wide appeal. The series of maps ranges from one of atlas scale to show the relative position of the Saar and one on a scale of 1 : 200,000 to numerous maps of economic and human distributions. Every conceivable method of cartographical representation is here demonstrated, including the plotting of circular graphs to illustrate the proportions of railway traffic in daily goods under the several groups of industrial commodities dealt with at each individual station. For all the more important centres there are town-plans which are so constructed as to give some indication of the historical development of each town. The maps have been designed by a number of authors who contribute more than one hundred pages of explanatory text. The collection of photographs is valuable and well reproduced.

The only serious criticism to be offered is that certain of the composite maps are so complex that, although close study will reveal their full value, at the first glance they do not present a very clear picture.

H. C. K. H.

DAS RUHRGEBIET, IM WECHSELSPIEL VON LAND UND LEUTEN, Wirtschaft, Technik und Politik. By HANS SPETHMANN. *Berlin: Reimar Hobbing 1933. 10 × 6½ inches. Erster Band. Von der Vorrömerzeit bis zur Gestaltung eines Reviers in der Mitte des 19. Jahrhunderts. 252 pages. Zweiter Band. Die Entwicklung zum Grossrevier seit Mitte des 19. Jahrhunderts. 257-676 pages; illustrations and maps. M.22.50*

These first two volumes of an extensive work on so important a region make one eager for the third. The first volume traces the development of the region from pre-Roman times to 1857, while the second, which is much larger, brings the reader to 1914. The greater part of the work is devoted to industrial aspects

treated on a historical basis, but the geographer will find a large amount of valuable material. Maps showing the growth of the chief centres of population and the many photographs alone ensure the geographical interest of the book; regret must be expressed that such illustrations should be so insecurely gummed. The statistical material is extraordinarily complete, and it is not only admirably utilized in the text but is frequently presented in a tabular form which summarizes concisely the accompanying discussion. An extensive bibliography is included, but the lack of an index, which possibly will be found in the third volume, must at present be regretted.

Such a thesis might well be used as a model for the study of our own coalfields, upon which no such exhaustive research has yet been accomplished.

H. C. K. H.

ASIA

LORD OF ARABIA: Ibn Saud. By H. C. ARMSTRONG. *London: Arthur Barker 1934. 9 x 5 1/2 inches; 306 pages; sketch-maps and portrait. 9s*

The declared object of the writer of this book is to describe a Moslem and an Arab of outstanding personality in terms that can be readily understood by Christians and Europeans, and in this special purpose he has been successful. But in the collection of a vast amount of information, the major portion of which has been, as he tells us, from word of mouth, it is not surprising that some portions should be inaccurate, or even imaginary, according to the varying reliability of the informants and in view of the fact that many years have passed since the events occurred which are recorded in the earlier chapters.

Mr. Armstrong has descriptive ability, and he has presented with striking reality scenes which have marked the life and career of this remarkable personality, even though we might wish that a slight touch of Hollywood had been omitted in certain places. The intensely suspicious nature of the Arab is well brought out in the history of Ibn Sa'ud's relations with Bin Rashid and Faisal-ud-Dawish, and again with Shaikh Mubarak of Kuwait and his son Salim. Astute politician though Mubarak was, it is certain that he did not deserve all that Ibn Sa'ud thought of him. Mubarak frequently assured us with obvious sincerity that his chief object for many years had been to free himself and his principality from all semblance of Turkish rule; and his delight was unbounded when we informed him of the entry of the Porte into the world war. Hence it is odd to read of his having at any time received "money and men from the Turks" to be employed in the extermination of Ibn Sa'ud; and that he had "declared for the English" in the war, as though there had been some doubt as to which side he would take. Nor was he in the least apprehensive of attack from Basra or elsewhere, as Mr. Armstrong believes.

Salim, no doubt, was a difficult character, but his hatred of Ibn Sa'ud seems to the writer overstated. We find it no less difficult to accept the story of Mubarak's treachery related on p. 133. It is extremely unlikely that he would have taken any steps, particularly at that time, which might have favoured Turkish interests even indirectly. Ibn Sa'ud seems also to have misjudged the English on occasions. For instance, he apparently failed to realize either that they would certainly have discouraged, through their Political Agent at Kuwait, any interference with him by Salim; or that the failure of King Husain to be represented at the Kuwait Conference destroyed any lingering sympathy the English might have had for that stubborn potentate in the struggle between the two.

Mr. Armstrong writes in an original and arresting style which is well suited to his subject, as is the unusual arrangement of the book to the constant and

abrupt changes of scene. Little or nothing appears to be lost by the absence of illustrations. A few mistakes might have been corrected; for instance, the *mahmal* is not a "box-like erection with a tent-shaped top"; this refers to the covering. The Arabic word *mutawwa* does not mean a preacher, and the Imam of Yemen is named Yahiya, not Yaha. W. G. G.

TUNGKHUNGIA BURANJI OR A HISTORY OF ASSAM, 1681-1826

A.D.: an old Assamese Chronicle of the Tungkhungia Dynasty of Ahom Sovereigns. Compiled, edited, and translated by S. K. BHUYAN. London: *Humphrey Milford* 1933. 8½ × 5½ inches; xxxii + 262 pages; illustration. 15s

Assam is peculiar among the provinces of India in possessing vernacular historical records known as *buranjis*. The keeping of such chronicles, written on strips of bark and maintained in former times by all leading families, was introduced by the Ahoms, who first invaded Assam from the upper Irrawaddy basin in the thirteenth century. Like many old records in India, these have been fast disappearing through various destructive agencies. Forty years ago systematic measures were taken by the then Chief Commissioner, the scholarly Sir C. J. Lyall, at the instance of Mr. (now Sir Edward) Gait, to stem the tide of destruction and promote research into the history, ethnography, and archaeology of the province. These bore such good fruit that in 1928 it was found expedient to establish a special Department of Historical and Antiquarian Studies. Thanks to the ability and zeal of its Honorary Director, Professor S. K. Bhuyan, this Department has already published several works of historical importance, the sixth of which is before us. The bulk of the volume comprises a translation of a chronicle dealing with the years 1751-1806 written by order of one of the highest Ahom officials, the Duara Barbarua, at the end of that period. As the Tungkhungia dynasty however ruled from 1681 to 1826, the editor has amplified the story from other vernacular records, so as to cover the whole period of the dynasty. This arrangement is not altogether satisfactory, but in all other respects the work must be highly commended. The introduction, glossary of vernacular terms, and very complete index will be of special value to students of Assamese history. C. E. A. W. O.

TIBETAN TREK. By RONALD KAULBACK. London: *Hodder and Stoughton* 1934. 9 × 5½ inches; 300 pages; illustrations and maps. 12s 6d

This delightfully written book describes a journey performed by Mr. Ronald Kaulback in 1933 in the little-known country of south-eastern Tibet, north of Assam and Burma. The young author was fortunate in having as a leader in the earlier part of the expedition such an experienced traveller as Captain Kingdon Ward, who has made this part of the Earth's surface peculiarly his own. The book is a light, modest, and most readable record of a journey of considerable importance. The expedition was not without its hardships, dangers, and difficulties: the impossible Mishmis, the terrible leeches, the sandflies, mosquitoes, and other begetters of disease. It may seem unwise to some of us for the author to have allowed his love of snakes to add an unnecessary danger to these unavoidable risks to health. In his anxiety to avoid burdening the narrative with scientific names and data, Mr. Kaulback has, if anything, erred in the other extreme. Many of his readers would like to know what exactly are the pygmy hares, stoats, snakes, butterflies, and plants he met with. A scientific name as a footnote would have added greatly to the value of the book, especially in the eyes of foreign readers. We would also have liked to have been given more dates. These are far apart and scantily mentioned. When one is reading of snow on the road, or some beautiful rhododendron in flower, it would be most useful,

especially to those who may follow where the author and his companions have broken the trail, to know this important factor.

No one is known to have visited Rima in 1903 (the year Sir Francis Younghusband commenced his attempts to negotiate with the Tibetan Government), and the date on p. 61 is possibly a misprint for 1912. Owing to some fault in the passport the author and his companion, Mr. Brooks Carrington, were obliged to leave Captain Kingdon Ward to continue his journey alone into Tibet, while they returned to Burma. The party separated with many regrets, and the author's disappointment was acute, but perhaps the necessity of being on his own may in the long run have been a valuable experience which will bear fruit. Mr. Kaulback's energy and initiative in making the short trip across to Lepa show that he does not let his opportunities slip. On this trip he learnt the valuable lesson, for a Tibetan traveller, that in Tibet you will be badly served by the populace unless you make some sort of an impression and appear to be a person of importance. A man travelling without servants has little chance of assistance in this feudal country. Too large a party, on the other hand, is equally objectionable as the inhabitants will have difficulty in supplying the necessary food and transport. The author has given us an interesting and well-illustrated book; he has youth, health, energy, and now experience, and we are sure to hear of him again in the annals of Tibetan travel.

F. M. B.

A HISTORY OF PERAK. By R. O. WINSTEDT and R. J. WILKINSON. *Singapore: Malayan Branch of the Royal Asiatic Society (Journal, vol. xii, part i) 1934. 9½ × 6 inches; 180 pages; illustrations*

It seems unfortunate that this book, which is of great importance to all who are interested in the history of the Malay States, should give no details of price or publisher. The authors state that it pretends no more than to provide a scaffolding for a definite history of Malaya; but future historians will have good cause to be grateful to them, for here are the very essentials of history, culled from the original sources and documents and not from other books. Most of the Malay material for the work was collected in Perak a quarter of a century ago; since then many Portuguese, Dutch and English records have been made accessible, and the authors have not spared themselves in sifting them. Thus they have been able to trace the chequered history of Perak from the first coming of the Malays to the time of British protection, and to show how the unhappy State was harassed by the Portuguese, the Achinese, and the Dutch, all eager to secure a monopoly over her tin, then made subject to Selangor and Siam in turn. Coming to more modern times the authors show the effects of British intervention in 1826, and give a brilliant and fearlessly critical account of the events which led to the murder of the British Resident, Mr. Birch, in 1875. The book also contains some valuable appendices, including Perak versions of the Malacca Dynastic Legends and details of the Perak Dynasty, regalia and royal heirlooms, of which H.H. Sri Sultan Iskandar has provided illustrations. Altogether this is a work of deep learning and patient scholarship on which the two authors, so eminently versed in Malayan history and affairs, are to be congratulated.

O. R.

JAVA PAGEANT. By H. W. PONDER. *London: Seeley Service [1934]. 9 × 5½ inches; 306 pages; illustrations and maps. 18s*

It is sometimes possible to write a better book about a country when one has spent six weeks in it than it is when one has spent six years. But Mr. H. W. Ponder's sensibility and curiosity have not been blunted by custom and long residence in Java. He knows the island well and what he did not know when he

sat down to write his book he has taken the trouble to find out. The result is a work which is comprehensive without being encyclopaedic, informative without being dull, and easy reading without being facetious. Mr. Ponder deals with the past and with the present, with the Dutch colonizers and the Javanese peasants, and shows his sympathetic interest in native arts and crafts. He has something to say about volcanoes, irrigation, teak, tea, and motor roads. He discusses the cultivation of tobacco, rubber, sugar, chinchona, and the other crops which grow to perfection in the island's fertile soil; he tells us something of Javanese royalty and of the disturbing elements at work in the island to-day. Indeed, this is such a good book that it is a matter for regret that most of the illustrations should be of indifferent interest and poorly reproduced, while it seems extraordinary that for a book of this price, which is of sufficiently high standard to rank as a work of reference, should not have been provided with a good map.

O. R.

AFRICA

DESERT AND FOREST: the Exploration of Abyssinian Danakil. By L. M. NESBITT. London: *Jonathan Cape* 1934. 8 × 5¹/₂ inches; 450 pages; illustrations, sketches, and folding map. 12s 6d

Almost every one who has entered Abyssinia by the railway has heard of the Danakils and of their well-merited reputation for savagery, for among them there is neither honour nor glory save according to the number of a man's victims, but few have a closer acquaintanceship with these natives. Until Mr. Nesbitt, accompanied by Signori Pastori and Rosina, traversed their country from south to north in 1928 it was known only as an arid and death-dealing land, enclosing the fabulous plains of Aussa, where the Awash river was reputed to disappear. Munzingei, Giulietti, and Bianchi had each endeavoured to explore this country, but in no case had a single member of their expeditions returned alive.

In 'Desert and Forest' Mr. Nesbitt gives an enthralling account of his great journey from the Awash station to the Eritrean frontier: a journey which was first described in this *Journal* for October, November, and December 1930 (vol. 76). The present volume is a fairly close version of Mr. Nesbitt's Italian book, 'La Dancalia Esplorata,' published in Florence in 1930 and noticed in the *Journal* (vol. 78, p. 361), although the latter is not mentioned by author or publisher in the English version. The first four chapters are weak, and give no indication of the pleasures that await the patient reader. But the journey itself is described in vivid and distinctive prose, and many passages are of great descriptive beauty. From the start to the finish Mr. Nesbitt and his companions courted the fate of their predecessors, and they were saved from it only by their unshakeable patience, their courage, and their determination. Three of their servants were murdered by the ever-watchful Danakils, and on numerous occasions a general massacre was imminent: once after the death of Bayona in the territory of the Madina; again when they discovered the scene of Bianchi's massacre at the Tiho waterhole; and again after leaving Labedin, where chance alone saved them from a marauding band of Uagerat. They journeyed through probably the hottest corner of the Earth, where death from thirst was ever threatening and the constant lack of water added enormously to their sufferings.

Mr. Nesbitt made a compass traverse of his route, in the course of which he discovered three large salt lakes and a most interesting chain of active volcanoes in the deserts north of Aussa, and his book contains much geological information

of considerable value. He left the problem of the disappearance of the Awash river unsolved, for although he remained encamped for several days in Galifagi on the edge of the Aussa plain he was unable to explore this area, and his conjectures on this subject have been subsequently proved incorrect. It is to be regretted that he does not give us more information on the tribal customs of such an interesting people. He makes a serious mistake in regarding the Assaimara as merely one of the numerous Danakil tribes, for the Danakil nation is divided into two sections, the Assaimara and the Adaimara, both of which are divided into numerous tribes, sub-tribes, and families. It is strange that he never mentions the Adaimara and only once the Assaimara, for the natives frequently refer to themselves by these terms. He calls the people indiscriminately Afars, Danakils, or Adals, which is confusing, as he omits to mention that all are collective names for this race, although the natives themselves only use the first, the other two being Abyssinian words unknown to most of them.

Had he inquired more carefully into their customs he might have considerably altered the views which he expresses on their methods of burial. He assumes that all the monuments he saw were tombs, whereas a number of them were almost certainly memorials, erected in a conspicuous place solely with the object of commemorating the dead man. Such is certainly the function of the cones of stacked tree trunks found on the eastern plains of southern Danakil. Nor does the reviewer believe that tombs differ in structure according to whether they are erected to a chief, a famous warrior, or an ordinary man. Throughout Danakil there is a considerable difference in the structure of both tombs and memorials, but the difference is one of individual taste, and does not depend upon the rank of the dead man.

Mr. Nesbitt makes no claim to be a zoologist, and most of his remarks on the subject of mammals and birds are too vague to have any great value. In some cases however he appears to picture scenes from animal life from imagination rather than from observation. For example, he describes crocodiles in the Awash river seizing their prey, and then basking on the river's edge with jaws wide open, while small birds the size of sparrows skip about in their gaping mouths picking out the shreds of flesh from among their teeth. The warriors of Aussa do not "wear conspicuous headgear calculated to inspire fear in the enemy," and so far from wearing "splendid turbans," the elders go bareheaded, following the universal custom. Such descriptions are intended to convey the atmosphere of the country, but they inevitably rouse misgivings about the scientific exactitude of Mr. Nesbitt's observations. Despite its inaccuracies however 'Desert and Forest' is a tale of heroic exploration, such as must now belong in greatest part to bygone days, and will rank among the epics of African travel.

W. P. T.

PALAEOLITHIC MAN AND THE NILE VALLEY IN NUBIA AND

Upper Egypt: a Study of the Region during Pliocene and Pleistocene Times. By K. S. SANDFORD and W. J. ARKELL. (Oriental Institute Publications. Vol. XVII. Prehistoric Survey of Egypt and Western Asia, Vol. II.) Chicago: University of Chicago Press [London: Cambridge University Press] 1933. 12 x 9 inches; xviii + 92 + xliii pages; illustrations and maps. 28s 6d

From the point of view of the geographer the principal interest of this volume lies in the evidence which it furnishes of the close relation between climatic and geographical conditions of Upper Egypt and Nubia on the one hand and East Africa on the other, and as a record of the history of the Nile. The book contains a very careful statement of the facts elicited from a detailed study of over 1000 miles of the Nile Valley and its terraces. Some of the conclusions which are

based upon those facts will not be generally acceptable, but the important thing is the record of the facts, for the interpretation must always be governed by the personal factor.

The present reviewer finds from the facts which are set out ample evidence for a long pluvial period at the beginning of the Pleistocene covering the whole of the period during which the Chellean and Acheulean stages of culture flourished. This is entirely in keeping with discoveries in East Africa, and the authors emphasize that during this period the main source of water for the Nile was the Red Sea hills, the Nile not having yet assumed its present form. Then came a dry period (after the 50-foot terraces) which again fits the East African evidence, and subsequently the Nile in its present form came into existence, which is exactly what those of us who have worked in East Africa have said all along was the case. The increase in the Nile watershed, which resulted from the formation of the present source of the Nile at Jinja at the north of Lake Victoria, meant that the water flow increased although the climate was drier than during the time of the higher terraces. This meant that the valley was filled to a high level and consequently gravels and silts of very late date with Mousterian and like Upper Palaeolithic cultures occur at high levels, even up to 100 feet above present river-level. The reviewer also considers that this may indicate a second pluvial period.

The book is amply illustrated, but some of the illustrations of implements are poor.

L. S. B. L.

THE UNDERGROUND WATER RESOURCES OF KENYA COLONY, and Records of the Results of Drilling for Water during the years 1926-1932.

By H. L. SIKES. *Westminster: the Crown Agents . . . on behalf of the Government of the Kenya Colony and Protectorate* 1934. 9½ × 7 inches; 40 + xxi pages; illustrations and map. 5s

During the last twenty years or so, much attention has been given to the underground water resources of Great Britain, the United States, and a few other countries, the work entailed in each case being the duty of the geological survey departments. As yet no such survey of Kenya has been initiated, so the initial study of this important question has been undertaken by the Public Works Department. This Department has, in recent years, been fortunate in having as its Director an engineer who has made a special study of water supplies; before the war he carried out the works which ensured an adequate supply of fresh water, from the Ngong Hills, for the Magadi Soda Co. Mr. Sikes's recent publication is a survey of the water potentialities of Kenya based first upon his knowledge of the geology of the territory and secondly on the results obtained from some 174 boreholes put down by his Department during the last six years.

The general development of a colony and particularly close settlement is to a great extent dependent on the multiplication of water sources. Africa is a tantalizing region, for at one season, of limited duration, the rivers are often rushing torrents and for the greater part of the year are either dry or mere trickles. Natural springs of any magnitude are rare and too often intermittent. The great areas of metamorphic rocks are not promising water-carriers unless surface decomposition has penetrated to a considerable depth, and such a condition is not common. The extensive region in the centre of the colony composed of recent igneous rocks offers slightly better possibilities. The sedimentary series, generally of Jurassic age, which occupy the strip of country behind the coastal zone should be much more productive than they appear to be, and unfortunately much of the water is saline. In spite of all these handicaps however a considerable amount of success has been achieved, and no less than

111 bores have proved successful, the average yield being 28,600 gallons per day.

The successful extension of man's efforts in this part of Africa depends to such a great extent on an ample supply of potable water that anything possible should be done to continue the study of the geological conditions throughout the inhabitable portions of the country, and it is obvious that the organization of a systematic geological survey should no longer be postponed. In the meantime the able review of the position provided by Mr. Sikes is of great importance and very helpful.

C. W. H.

NORTH AMERICA

THE CIVILIZATION OF THE OLD NORTHWEST: a Study of Political, Social and Economic Development, 1788-1812. By BEVERLEY W. BOND, JR. *New York (and London): The Macmillan Company 1934. 8½ × 5½ inches; x + 544 pages. 15s*

The "Old Northwest," a region of approximately 248,000 square miles, lies between the Ohio, the Mississippi, and the Great Lakes, and is now divided into the five States of Ohio, Indiana, Illinois, Michigan, and Wisconsin. The whole area was nominally in the possession of the United States after the Treaty of 1783, but at that time it only contained a few thousands of white inhabitants. Professor Bond's purpose is to describe the history of this area during the quarter of a century between 1788, when the first Governor of Northwest Territory was appointed, and the outbreak of the war of 1812, a period in which he states "the foundations of an American civilization were laid in this region." While his book is essentially historical in character, it has, nevertheless, considerable interest for the geographer who wishes to study the first stages of the westward expansion of the American people. From the political point of view the region is described as a "laboratory in which an American colonial policy" was worked out. The grant of the status of Territory to the public domain and the arrangement by which a Territory might subsequently receive the full rights of Statehood was first practised here, and the system was continued as the United States spread across the continent. The three chapters on agriculture, communications, and rise of trade and industry, which describe the economic development of the Old Northwest during this period, are of great value to the historical geographer, and show how a "civilization founded upon corn and wheat, upon pigs and cattle" was slowly brought into being, and incidentally throw light on the early development of important towns such as Cincinnati. The book unfortunately contains no maps, and reference to a large atlas is constantly necessary. This well-documented and very readable work will certainly be of greater service to the historian than to the geographer.

E. W. G.

L'AMERICA SETTENTRIONALE. By CARLO ERRERA. (*Geografia Universale Illustrata*. Edited by ROBERTO ALMAGIÀ. Volume Six. Pp. 1-528.) *Torino: Unione Tipografico-Editrice Torinese 1934. 10½ × 7½ inches; illustrations and maps. (Vol. VI complete) L.100*

The initial volume of so extensive a work as the 'Geografia Universale' is always of great interest. Eighty per cent. of the book is devoted to North America, which is treated firstly by means of continental distributions, and then, in Part II, on a threefold basis: (i) the northern part of the continent, under the political subheadings of Canada, Newfoundland, and Alaska; (ii) the mid-continent part of the United States and the Bermudas; and (iii) Mexico.

The treatment of each of these countries is mainly on the basis of general distributions: thus Canada has a brief section on the political history of the Dominion, followed by an account of the natural resources, economic develop-

ment, industries, commerce, and communications, and finally a section on the individual provinces which tends to resolve itself into a brief summary of which the more important towns and cities occupy the greater part. The treatment of the United States is similar, and in neither case is there any real regional development. The photographic illustrations are excellent, and, though a number are familiar, all are of real value to the text; on the other hand, maps and diagrams are less numerous than one might hope, so that it is difficult to understand the inclusion of expensive coloured maps on a scale obtainable in good atlases and the exclusion of diagrams of a less accessible type. The probable reply to such a criticism would be that in a work which is general and not regional in treatment a good map on a scale of 1:10,000,000 is the most suitable; but a good atlas should fulfil that function.

Throughout the North America section of the work the interests of the author lie definitely more in the urban and human geography, with the result that the agriculture, including the animal industries, of the United States is dismissed in thirty pages, while that of Canada receives very scanty attention. This seems rather ill-balanced in a continent of which so great an area is devoted to farming. The bibliography is not very extensive and would have been more valuable if supplemented by references to periodicals.

The remainder of the volume is devoted to the Central American Republics and the West Indies; its author opens with a short chapter on general distributions and then covers his subject republic by republic and island by island. Like his colleague, he deals with the several geographical features in turn, but, probably owing to the smaller extent of the units with which he is concerned, he gives a more complete impression of these republics and islands than is obtained of the several parts of North America. The bibliography of this section of the book is more comprehensive and includes references to periodical literature in addition to the standard books. The index of this volume is confined to place-names and is inclined to be scanty considering both the size of the book and the extent of the area described.

It is impossible to compare directly this Italian work with its corresponding volume in the 'Géographie Universelle,' which has not yet appeared, but, assuming a consistency of treatment in the latter, the outstanding differences would be the inclusion of more diagrams and maps in the French work, while the Italian would be more fully illustrated photographically. It may be anticipated then that the two works will not encroach upon each other but will be complementary, though the French series may prove the more attractive to the academic geographer.

H. C. K. H.

PRAIRIE SETTLEMENT: the Geographical Setting. By W. A. MACKINTOSH. (Canadian Frontiers of Settlement. In nine volumes. Edited by W. A. MACKINTOSH and W. L. G. JOERG. Vol. I.) *Toronto [and London]: The Macmillan Company 1934. 10 x 6¹/₂ inches; xvi + 242 pages; illustrations and maps.*

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The Canadian Pioneer Problems Committee was organized in 1929, and under its aegis historians, sociologists, economists, and agriculturists have pooled their resources in prosecuting research into the economic evolution of Prairie Settlement. The volume before us is the firstfruit of this impressive piece of team work; and, surely, if one more than another of the nine volumes in course of publication might be expected to supply both skeleton and connecting tissue for the whole, it should be this one on the Geographical setting.

The work appears to us to have been admirably done. The student of geography will find here, in compact form and lucidly set out, much material with

which to test the validity of his geographical principles. Every stage of the adjustment by the pioneer of his activities to his somewhat recalcitrant physical environment is recorded in detail. The coming of the railway, of the chilled-steel plough, of labour-saving machinery, of roller milling, and of the breeding of short-maturing grains, each marked a stage of this adjustment.

And now difficulties arising from depressed prices are added to those consequent upon that variation of yield which is so characteristic of wheat production in climatically marginal regions. What are, and what are likely to be, the reactions to these changing economic conditions? What new adjustments of farm practice are foreshadowed? Already there has been evacuation of farm land in the more marginal areas, and it seems that here, as in the United States, effort should be concentrated on the best use of the better lands. There is the more need then for these large-scale surveys, and we may expect some light to be thrown on these problems in the subsequent volumes.

We wish that the author could have afforded space for a fuller description of the characteristic topographic features of the Canadian Prairie and Park region, for they have a real bearing on the detail of crop distributions, and are perhaps best described in relation to their physiographic evolution, a subject of which there is here no mention. There is however an admirable series of significant illustrations, and the text is supplemented by a large number of most helpful diagrams, many of them culled from the official Statistical Atlas of the Prairie Provinces, which was published in 1931. Thus we have recent climatic maps, a simple soil map, and a great number of crop distribution maps. There are also maps showing successive stages in settlement, and some showing areas of recently abandoned land.

Though planned in relation to the economic and social survey, and for that very reason falling short of a complete geographical account, this work, even by itself, will prove of value to the Geographer. LL. R. J.

CENTRAL AND SOUTH AMERICA

BAHAMAS: ISLES OF JUNE. By H. MACLACHLAN BELL. *London: Williams and Norgate 1934. 8½ × 5½ inches; 226 pages; illustrations and map. 10s 6d*

The Bahamas have an enthusiastic showman in Major Bell, and the result of his enthusiasm should be to send tourists to their glass-clear waters and sunny beaches in increasing numbers. But his book is much more than an advertising brochure. He has visited many of the seven hundred islands which go to make up the group, and he has studied their history with some care. It is not an easy history to write in brief, for even before Charles II gave the Bahamas to the Lords Proprietors of Carolina Charles Towne (which afterwards became the Nassau of to-day) was the resort of pirates and buccaneers; they gave way to the blockade runners of the American Civil War, and they in their turn were succeeded by the modern bootleggers who imported liquor into Nassau and shipped it up to Rum Row in fast-sailing schooners. But Major Bell does justice to Nassau's tangled history and to the sinister and gallant characters who have appeared upon its stage; he does not exaggerate the beauty and glory of the islands, and speaks of the good qualities of the Bahamian negroes, whose living conditions, he says, are infinitely preferable to those of the natives of the western islands of Scotland: not that that is saying much. Particularly admirable is Major Bell's chapter on San Salvador, the first landfall of Columbus in the New World, now officially known no longer by the name of Watling the buccaneer, but by the name the Admiral gave it. This book is sound enough as a work of reference to have deserved an index and, most certainly, a better map. O. R.

AUSTRALASIA AND PACIFIC

FIELD NOTES ON THE CULTURE OF VAITUPU, ELLICE ISLANDS.

By DONALD GILBERT KENNEDY. (Memoirs of the Polynesian Society. Vol. 9.)
New Plymouth, N.Z. 1931. 10×6 inches; xviii+326 pages; illustrations

The Ellice group lies south and somewhat east of the Gilberts, and thus constitutes the most southern archipelago of Micronesia. Vaitupu, one of its smallest islands—about 4 miles long by 3 broad—carries a population of some six hundred souls, and it is these people whom Mr. Kennedy has investigated.

The history of Vaitupu starts fourteen generations ago, when one Telematuea came from Samoa and settled on the then uninhabited island. Mr. Kennedy considers the general characteristics of the Vaitupians to be essentially Polynesian, "although their material culture and social organization are of a very low order of development." Whether this is the result of isolation—no greater, be it said, than that of other Micronesian islands—or due to White influence is not stated. Actually the island was converted to Christianity some sixty-five years ago by Samoan pastors of the London Missionary Society, who at once assumed autocratic power in the regulation of life and customs. The dialect of Samoa into which the Bible has been translated became the official language of the Ellice peoples, the result being the development of a hybrid patois quite unsuitable for transmitting the ancestral traditions and folklore. Games, dances, and poetry were also suppressed by these first missionaries, as well as the customary tattoo and ear-lobe distension of ancient times. Indeed, more than thirty years ago Mr. Hedley, who resided on Funufuti for nearly three months during the visit of the Royal Society's reef-boring party, reported of the Ellice group: "Christianity has now been embraced for a quarter of a century, and the memory of the old rites is rapidly vanishing. In a few years the knowledge of these that might still be gleaned will have become extinct." To judge from Mr. Kennedy's volume, this knowledge has indeed become extinct on Vaitupu, the section on the old religion occupying only 5 pages out of 326.

At first sight it would appear that Vaitupu should present an opportunity of testing Rivers's belief that intimate social structure tends to persist long after all else of old belief and custom has ceased to exist. Actually its extremely small size and the intensity of the mission influence it underwent militate against Vaitupu being a fair test. In sixty-five years scarcely a shadow of the old culture remains other than technical appliances, mostly concerned with canoes and fishing. In spite of the continuance of these activities the large sailing canoe of ancient days is no longer made; tradition merely preserves incidental details of its construction, and the canoes at present in use on Vaitupu are dugouts, with an outrigger float on the port side.

"We find the easy conquest of religious forms by proselytizing missionaries closely followed by the submergence of the whole former social structure—a submergence so complete that even the most tedious and painstaking inquiries fail to reveal more than a few of its most salient features. Ceremonies involved in ancient rites and customs, games, courtship, marriage, birth, adult initiation, and death, have disappeared completely, leaving nothing more than a half-understood word here and there amid their still less-understood substitutes. Only such practices as were intimately incorporated in the methods of providing for physical needs—food, sexual relations, and self-preservation—that is, broadly speaking, the main elements of the material culture, have been retained. . . ."

Thus Mr. Kennedy's summary—his epitaph upon an adventurous sea-faring people.

C. G. S.

POLAR REGIONS

METEOROLOGICAL RESULTS OF THE BRITISH ARCTIC AIR-Route Expedition 1930-31. (Meteorological Office Geophysical Memoirs, No. 61.) By S. T. A. MIRRLEES. London: H.M.S.O. 1934. 12 × 10 inches; 62 pages; maps and diagrams. 4s 6d

In this volume Mr. Mirrlees has given a careful analysis of all the meteorological observations made in Greenland by the B.A.A.R.E. during the period August 1930 to July 1931. At the base station of the expedition, which was at the head of a small fjord some 30 miles west of Tasiusak, meteorological observations were made from 5 August 1930 to 25 July 1931; and a station was also established about 140 miles north-west of the base, on the Ice-Cap at an altitude of 8000 feet. At the latter station observations were made every third hour from 7h to 22h inclusive (time 3 hours slow on G.M.T.) during the period 8 September 1930 to 26 April 1931.

The visibility at the two stations is first discussed. At the base the large proportion of good visibilities (4¹/₄ miles or more) was very striking; most of the occasions of bad visibility being associated with precipitation in some form. At the Ice-Cap station visibility of 440 yards or less, corresponding to fog, was noted in nearly half the observations in the months November to February. On most of these occasions the low visibility was due to precipitation or to drifting snow, the latter in conjunction with strong winds. On clear days the visibility was usually extremely good.

During the months October to April winds of forces 8-12 (gales) occurred with fair frequency at the base, 1 in 6 of all observations in February being within these limits. At the Ice-Cap station no gale winds were observed up to the end of 1930, the maximum in any month occurring in January 1931, when 5 per cent. of all observations showed force 8 or above. Many of the gales were of brief duration, the average duration being 12 hours, and the extremes 5 hours and 30 hours. Of the 42 days on which winds of gale force were observed sometime during the 24 hours, 17 showed no gale at any of the 3 observation hours. Frequently it was noted that on days when gales occurred, when the wind fell below gale force it usually became quite light. Some of the gales were of great severity, force 12 being reached on 11 days, force 11 on 6 days, and force 10 on 2 days. The prevailing direction of gales was NNW. or N. On the Ice-Cap the highest wind noted in any of the observations was force 9. It is likely that the greater wind speeds observed at the base were due to katabatic flow down the slope of the Ice-Cap, and it is probable that at least some, if not all, the northerly gales are to be explained as the flow of cold air down the slopes of the Ice-Cap, the flow being set in motion by a suitable pressure gradient for northerly winds. Katabatic flows are usually shallow, and it would be of great value to have some estimate of the vertical extent of these gale winds. The fact that gales were not simultaneously observed at Angmagssalik, some 8 miles away, would accord with the suggestion that the gales were of limited vertical extent.

The suddenness with which gales arose on the Ice-Cap was remarkable. On March 24 a sledge party about 105 miles from the Base, at an altitude of 7000 feet, recorded a change from dead calm to force 9 from N. between 8h 30m and 9h. On the same day a northerly gale set in suddenly at the base at 14h 30m, force 11 being observed at 21h.

Mr. Mirrlees considers the possible association of these gales with subsequent weather in the North Atlantic, and finds that the evidence is insufficient to enable any definite conclusion to be drawn. It is doubtful whether these gales

can be the "outbursts of cold polar air" which should be the prelude to disturbed conditions in the North Atlantic, if they are true katabatic flows and are shallow. Georgi¹ has described some pilot-balloon observations in the north-west of Iceland which indicated outbursts of cold air from NNW. reaching to a height of 15 km., but these were frequently associated with light winds in the lower layers of the atmosphere. It is therefore clear that no definite conclusion can be arrived at until further observations become available.

During the time when the Ice-Cap station was occupied the German expedition under the leadership of the late Alfred Wegener maintained a station on the inland ice some 275 miles north-west of the B.A.A.R.E.'s Ice-Cap station. A preliminary note by J. Georgi, published in this *Journal*, vol. 81, 1933, p. 344, points to important meteorological differences between the conditions at the two stations, and it will be of interest to compare the results of the two expeditions when those of the Wegener expedition are available.

Of the tables of miscellaneous phenomena, optical phenomena, and of observations taken at the Base and Ice-Cap stations, little need be said beyond that they are complete, and that they represent a magnificent effort on the part of the observers. The expedition is to be congratulated on the volume of observations obtained, and on the very happy choice of the meteorologist to discuss these observations. Mr. Mirrlees has carried through his task with care, thoroughness, and restraint.

D. B.

PHYSICAL AND BIOLOGICAL GEOGRAPHY

KLIMA DER UNION DER SOZIALISTISCHEN SOWJET-REPUBLIKEN. Teil II. Luftdruck und Wind in der U.S.S.R. Lieferungen 1 und 2. Luftdruck nach Monatsmitteln und Windrichtung in der U.S.S.R. By A. KAMINSKY. *Leningrad: Geophysical Central Observatory 1932. Text: 14 × 10 inches; 121 + 43 pages; sketch-maps and diagrams. Atlas: 21 × 16 inches; 44 pages. \$7.50.* In Russian and German.

The Atlas shows the mean distribution of pressure and wind for every month of the year over the whole of European and Asiatic Russia as well as for the former alone. Over the mountainous Caucasus region monthly isobars are given for sea-level, 500 metres, and 1000 metres. There are also plates of diagrams indicating the annual variation of pressure at different stations. In the text a good deal of space is given to the discussion of the annual variation of pressure at mountain stations in relation to that at sea-level. The tentative conclusion is reached that mountains do not very seriously interfere with the circulation in the free atmosphere over neighbouring plains. Nevertheless we should not advise aviators to trust blindly in so comfortable a doctrine, regardless of particular meteorological conditions.

L. C. W. B.

ECONOMIC AND HISTORICAL GEOGRAPHY

OUR EARLIEST COLONIAL SETTLEMENTS: their Diversities of Origin and Later Characteristics. By CHARLES M. ANDREWS. *New York University Press; London: Humphrey Milford 1933. 9 × 6 inches; vi + 180 pages. 10s 6d*

The Anson G. Phelps Lectureship in New York University was founded to encourage the study of early American Colonial History, and we have here collected the third series of lectures on the foundation. Professor Andrews is

¹ *Arktis* 1, heft 3/4.

perhaps the most eminent living scholar in his chosen field, and he has a happy facility in making the results of his life-long researches clear and interesting to the general reader. Most writers of early colonial history have been afflicted with "patriotic and nationalistic obsessions that have led to an interpretation of the American past in a manner rather ingenious and artificial than historical," but in these lectures Professor Andrews by a comparative study of the various colonial communities in the light of the motives that gave them birth places them in their true historical setting. "Little that took place in America in the seventeenth century can be construed as American, in any proper sense of the word," for the world of the colonies was then an English world and the ideas and purposes of the founders were a part of the ideas and purposes that were influencing men at the same time in England. When it is studied in this way the history of English expansion escapes that episodic disconnectedness which so often mars the works of secondary writers and appears as an essential and integral part of our national story. Professor Andrews shows how each of the colonial attempts in turn arose from the circumstances of the time and how their failure or success was dependent not only upon the personal actions or ideas of their promoters but on general historical causes. The chivalrous attempts of Gilbert and Raleigh were inopportune and premature, for the world was not yet ready. Colonization could not be successfully undertaken by men who had no desire for peaceful conquest, but were filled with a passionate zeal to "wreak a crusader's vengeance on the despoilers of the world." Only as the power of Spain was gradually broken down by a combination of causes far removed from the colonial sphere and by the concurrent efforts of the Englishmen, French, and Dutch, who were struggling to vindicate their national unity against the menace of Spanish supremacy, could the shores of the New World be opened to successful colonies.

Without the resources of accumulated wealth, neither courage, persistence, nor religious zeal would have been of much avail. The active participation of a rich bourgeoisie ready to invest a portion of the reserves of capital that they had stored up in the prosecution of trade and commerce in old and settled countries was necessary, and they could only be persuaded to finance colonial efforts by the belief that they offered opportunities for profitable investment. Raleigh might demonstrate the practicability of transporting English men and women overseas to find new homes on a new soil, but it needed the persistence and abundant financial resources of Sir Thomas Smythe, the great capitalist, to nurse the infant colony along under most discouraging circumstances and without immediate reward before Virginia could be successfully rooted in the soil of the New World. Thus Smythe, whose name has been largely lost to sight among the more colourful characters of the period, was probably the greatest single figure in the founding of the early English colonies.

It is impossible within the limits of a short review to summarize the admirable and suggestive generalizations in which Professor Andrews sums up the essential lessons to be learned from the history of each of the early continental colonies in turn. Almost every page of this little book contains some pregnant and suggestive piece of analysis of historical causation that is of profound interest not only to students of history but also to those readers who wish to place the story of geographical discovery against its real background. There is hardly a reference to historical geography as such, but in a very real sense the book is perhaps the most significant contribution to the advancement of that subject that has been made by a pure historian for some years.

A. P. N.

GENERAL

HABITAT, ECONOMY AND SOCIETY: a Geographical Introduction to Ethnology. By C. DARYLL FORDE. London: Methuen & Co. 1934. 9×5½ inches; xiv + 500 pages; illustrations and maps. 15s

In this work Professor Forde has made a contribution of first importance alike to English geographical literature and to the philosophy of Geography. To treat Human Geography with derision because of the feebleness or vulnerability of its conclusions is indicative of shallow thinking. The subject is one which we dare not neglect, but to solve its problems, even to state them correctly, it is necessary to be master of twin sciences and twin disciplines. Just as, to paraphrase the words of a famous educational psychologist, he who essays to teach John Latin must know not only the intricacies of the Latin tongue but also the intricacies of John's mind, so he who enters the field of Human Geography must know both Geography and Humanity. Professor Forde has had the advantage of a rigid training both in Geography and Anthropology, and he can point out clearly the fallacy underlying the attempt to link man's activities directly and causally to his geographical environment. Geographical determinism cannot succeed, for as Febvre said long since, "wherever 'man' and natural products are concerned, the 'idea' intervenes." Or, as Professor Forde puts it more concretely: "Between the physical environment and human activity there is always a middle term, a collection of specific objectives and values, a body of knowledge and belief; in other words, a cultural pattern" (p. 463). "Geographers, economists and sociologists," he says on p. 461, "have all on occasion produced a lay figure, a 'primitive man,' stripped of reality and re-dressed according to need, with which to portray particular theories. . . . Selecting an instance here and a generalisation there, it is possible to provide a superficially plausible case for almost any scheme of causation or any theory of development. . . . The reality of human activity escapes through so coarse a mesh." The truth can, in fact, only be arrived at through a minute unbiassed examination of particular societies. Hence the first three parts of this book (comprising four-fifths of the whole) are taken up with purely objective studies of groups of peoples outside the ambit of Western civilization. These are classified roughly as Food-gatherers, Cultivators, and Pastoral Nomads, the limitations and ambiguities of such a nomenclature being carefully discussed. The choice of particular examples in each class has been directed in the first instance towards the inclusion of a variety of environments, from equator to pole, from forest to desert, and in the second instance towards bringing out the varying complexity of the cultural pattern, and the varying degrees of technical skill and material equipment possessed by peoples coming within one and the same category and broad natural region.

The fourth part of the book deals with the conclusions that can be drawn from the facts thus impartially presented. It includes a valuable and fascinating survey of the most acceptable and up-to-date views regarding the origin of cultivated plants and of the domestication of animals. Professor Forde, a pupil of Sir G. Elliot Smith, belongs to the "diffusionist" school, but he makes no extravagant claims for a single race or nation to be the fountain-head of culture. He points out, for example, that the *riding* of domestic animals was a mode of utilization first discovered quite outside the cradle-area of civilization. In listing the various uses of the chief domestic animals in this connection, pigeons are mentioned merely as "pets rarely eaten." But the mediaeval dove-cot had a recognized importance as the source of an extremely rich fertilizer, and it would be interesting to know at what stage the value of animal manure was

recognized. Again, did the use of dung as fuel and for smearing walls and floors precede or follow domestication? Such problems however are rather outside the scope of this book, in which, as is evident, severe compression has been necessary. Very occasionally this has resulted in lack of lucidity, but in general the style is clear and engaging, and few errors have escaped the proof-reader. The reviewer has however noted the following: "Chalybes" for "Chalybes" on p. 387, "north-eastern" for "north-western" on p. 426, "al Ubaid" for "al 'Ubaid," p. 444, "aversion for" instead of "aversion from," p. 382.

The text is illustrated by a large number of maps and line drawings, the latter skilfully prepared from photographs by Mr. Anthony Brown, who is better known as a flower painter. Attention must also be drawn to the excellent bibliography, and to the low price of the book, which comprises nearly five hundred closely written pages. The price is such as to allow its introduction as a text-book into every Honours School of Geography, a place it undoubtedly deserves. But it should have a wider usefulness than this: the traveller-geographer, the missionary, the native commissioner, all who seek to gain insight into native problems, will find their minds enriched and stimulated by this 'Geographical Introduction to Ethnology.'

E. G. R. T.

SWORD AND SPEAR. By Captain F. H. MELLOR. *London: Selwyn and Blount* [1934]. 9 × 5½ inches; 288 pages; illustrations and sketch-map. 15s

Books of travel and sport are in fashion, and Captain Mellor is in a position to add to their number; but in his 'Sword and Spear' the attraction of much interesting experience related in an amusing way is discounted by occasional unsavoury detail and the repetition of words which are better omitted.

The book is in two parts. The first deals with a brief period of regular service in the United Provinces of India, followed by a tour of duty in Constantinople and its neighbourhood which included skirmishes with the Kemalists and the disarming of certain Greek villages in Anatolia; and finally more service in South India prior to "falling beneath the Geddes axe." In Mysore the author heard some wonderful stories: one, of a horse which kicked off a buffalo's horn; another, of a crow's nest which on being raided was found to contain twenty golf balls; and a third, of a British soldier who carried home a *karait* in his pocket and caused the death of a comrade by placing it in his bed to give him a surprise.

The second part first describes rough life as a trooper in the British South African Police, out of which the author bought himself at the end of six months. This is followed by an account of service in the Northern Provinces of Nigeria as an Assistant Commissioner of Police. The latter period, with its "Spanish interlude" dealing with a leave of absence spent among the Basques and Andalusians, is perhaps the most attractive portion of the book: much interesting information is to be found in the concluding chapters, notably those entitled "Islam," which shows the survival of latent fanaticism among certain North African tribes, and "Black Magic," which deals with some of the strange local customs and superstitions.

The full-page illustrations are very good indeed, and are well chosen for the scenes and incidents to which they relate.

W. G. G.

THE MONTHLY RECORD

AGRICULTURAL GEOGRAPHY OF NORTHUMBERLAND

In *Geography* for December 1933 Mr. E. Clucas Sykes reviews the predominant types of farming in different parts of Northumberland together with the changes which have been in progress according to statistics supplied by the Ministry of Agriculture and Fisheries for the years 1870, 1890, and 1929.

An agricultural survey of any region is only possible on a regional basis which disregards artificial administrative units; and the county is divided for the purpose into six distinctive natural regions which are in effect agricultural regions and are chosen as follows: Cheviot Hills, Moorlands, Breamish-Till Valley, Coastal Plain, Cultivated Uplands, and Tyne Valley.

The Cheviot Hills, defined structurally by the outcrop of igneous rocks along the Border, are specially suited to sheep farming, and owing to improvement of the land by drainage the number of sheep has almost been doubled since the beginning of the nineteenth century. There are two celebrated breeds, the Cheviot and Scotch Blackface, the former being nurtured on the lower grassy slopes and foothills, the latter a hardier race, confined to the wild heather-covered hills. Shelter for the sheep from the severe winter storms is provided by plantations and stone enclosures. The next region, the Moorlands, occupying about 41 per cent. of the area of Northumberland in the west and centre, forms structurally a link between the Cheviot Hills and the Pennines properly so called; but nomenclature is very loose and nearly all maps show the two systems as separated only by the gap of the South Tyne. Large areas of the Moorlands whose peaty summits are impressively relieved by the dark crags of the Fell sandstone are characterized by extreme solitude and severe weather, being windswept, subject to heavy rainfall, and in winter often covered with deep snow. The land down in the dales is now entirely given over to grass for the raising of sheep and cattle. Excellent Shorthorns are reared even on exposed farms at high altitudes.

In marked contrast to the two lofty regions just considered is the lowland formed by the valleys of the Till and Breamish, winding round the foot of the Cheviot Hills to open out into the Tweed valley. This lowland, composed largely of sandstones and shales, is agriculturally rich and has long been noted for the advanced state of its husbandry. It enjoys milder springs than any other part of the county with the possible exception of the Tyne valley. Good cereal and root crops are raised, especially turnips, but, as everywhere else in Northumberland, the tendency is now to replace arable by meadow land. The Coastal Plain between Berwick-on-Tweed and the Wansbeck, covered widely with glacial deposits, is likewise a region of scientific farming, but suffers in comparison with the sheltered Till-Breamish valley from exposure to high north, east, and south winds, from spring snowfalls, and uncertain harvest weather. The Cultivated Uplands occupy much of the south-east of the county between the Moorlands and the Coastal Plain. Formerly large crops of wheat and oats were raised on the heavy boulder-clay soils, but this part of the county suffered most from agricultural depression at the end of last century. Demand for food however in the Newcastle industrial area has given an impetus to stock-raising. The remaining region, the Tyne valley, is covered with glacial sands and gravels with stretches of alluvium. Large quantities of vegetables and fruit have for long been sent from Hexham to Newcastle, and of late years there has been a big increase in the production of milk quickly carried by motor lorry.

Northumberland as a whole has suffered less from agricultural depression

than other parts of England and has been quick to adapt itself to changed economic conditions. Apparently there is little prospect for corn, but an assured future for livestock and the dairy. Research in fertilizers at the Cockle Park Experimental Station has led to greatly improved pastures and lengthening of the period of summer grazing.

HISTORY OF A SEVERN VALLEY COALFIELD

The development and decline of the Coalbrookdale coalfield, in the middle Severn valley, is outlined by Mr. T. W. Birch in *Geography* for June 1934. The area played an important part in the early development of the iron industry, and between 1707 and 1870 expanded very rapidly, since when coal mining has declined relatively in comparison with richer fields, and the iron industry absolutely. The first developments were due to the proximity of the coal, which was at first obtained from outcrops or by adits, to the navigable Severn. The demand for coal was largely domestic, for the primitive iron industry depended upon wood fuel, so that it spread beyond the limits of the coalfield. A tile industry, using the local beds of potting clay, seems to have existed in the late Middle Ages. The second period, during which the iron, coal, and clay industries were developed in unison, dates from the advent of Abraham Darby in 1707. Though prejudices were not overcome for fifty years, he succeeded in making use of coal in the iron furnaces. The industry however continued to be widely dispersed, for coke did not replace charcoal in the forges until late in the century, when the mine owners gained control of the forges. In the early nineteenth century the furnaces moved eastwards from their former general position on the junction of the Upper and Middle Coal measures, to the richer but deeper seams which could be opened up by the improved mining technique. This necessitated the building of canals and railroads to maintain contact with the Severn, the foundation of the region's prosperity.

The decline of the iron industry did not come suddenly: the most powerful contributory cause was the exhaustion and low metal content of the local iron stone. Between 1860 and 1878 the production of pig iron had fallen by 42 per cent. Further advances in mining engineering also removed the advantages which had been derived from the shallow pits of the Coalbrookdale field, and railway developments favoured richer coalfields to which superior foreign ore could be brought. The failure during the late eighteenth century to improve the navigation of the Severn, though it did not ultimately affect the fate of the iron industry, handicapped the region in the development of minor industries. There are now only three blast furnaces and the industry specializes in finished goods of relatively high value, using supplies of ore from outside the district. Coal mining, though not so diminished, does not now suffice to supply local demand. The clay industries alone show no decline, and have prevented a big decrease in the population of the southern coalfield, where, around the Gorge, the clay beds are accessible without the sinking of shafts.

RELIEF OF THE SEA-BED AROUND JAPAN

Messrs. N. Yabe and R. Tayama have recently made a detailed study of the form of the sea-bed around Japan and Korea, based on about 360 charts issued by the Hydrographic Department of the Imperial Japanese Navy, the results of which have been published in the last *Bulletin* of the Earthquake Research Institute (vol. 12, 1934, pp. 539-565). The coasts of both countries are surrounded by even surfaces or submarine terraces of different depths. The normal number of such terraces is at least nine, but in every place they are not all present, and each terrace varies slightly in depth. The nine terraces, in order of increasing

depth, are distinguished by the letters A, B, C, D, E, F, G, H, and J. The three upper terraces, A-C, have depths of 0 to 16 feet, 32 to 65 feet, and 65 to 100 feet, and occur only in certain areas, especially in Hokkaido, the northern island of Japan. The next three shelves, D-F, are 130 to 200 feet, 260 to 330 feet, and 390 to 460 feet in depth, and are well developed in almost every region, the greatest width of the lowest terrace, F, being $9\frac{1}{4}$ miles. These six terraces form the continental shelf. The scarp by which the terrace G is separated from the higher terraces is in all parts steep and distinct. The terrace itself ranges in depth from 660 to 750 feet, and in width up to $12\frac{1}{2}$ miles. The remaining terraces are somewhat limited in their distribution, the usual depth of H being from 980 to 1150 feet and its greatest width $13\frac{3}{4}$ miles, and those of the lowest, J, from 1970 to 2620 feet and $7\frac{1}{2}$ miles. The terraces are as a rule overlaid by sand, mud, or gravel, but in parts the floors are rocky.

All round Japan and Korea these shelves, both upper and lower, are crossed by troughs, which may descend to a depth of nearly 2000 feet. In most of them the landward ends lie off large rivers and their directions are in line with the land valleys. No marked differences can be detected between the submarine troughs and the present valleys, except such as are due to the deposit of sediments, and there can be little doubt that the authors are correct in regarding the furrows as submerged valleys.

Some of the features of the sea-bed round Japan seem to resemble fault-valleys, horsts, etc. These tectonic lines are either nearly parallel or at right angles to the general trend of the coast-line. Good examples of the parallel tectonic lines are to be found along the Japan Sea coast near the peninsulas of Tugaru and Tango, where several of them have given rise to four narrow elevated and parallel strips. Similar lines, but of less extent, occur off the Pacific coast. The radial tectonic lines are especially frequent on the Pacific side, well-known examples being those that occur in Sagami and Suruga Bays. C. D.

OBITUARY

MICHAEL CORBET ANDREWS

The cause of cartographical history has lost a zealous supporter in Mr. M. C. Andrews, of Belfast, well known both in this country and abroad as a keen student of mediaeval and early modern maps. Engaged primarily in business—he was a prominent linen manufacturer in Belfast—he took up the study as a hobby many years ago, and pursued it with ardour in the leisure moments of his busy life. At the time of his death he was, we understand, arranging for the publication of the greater part of his unique collection of photographs of mediaeval maps, brought together from the most varied sources. He had a remarkable flair for discovering examples of such maps hidden away in old libraries, at home and abroad, and when some years ago he put forward an original scheme for their classification in a paper read before the Society of Antiquaries his collection of photographs already numbered over 600. A good many have been, or are being, made available to students by publication in the great work on African (particularly Egyptian) cartography, edited by Dr. F. C. Wiederer by Prince Yousouf Kamal, but many more have still to be reproduced.

A large number of these early maps are the crude productions of schoolmen out of touch with realities, but are of interest none the less as helping to reveal

the mind of the Middle Ages, as was well put by a speaker in the discussion at the Society of Antiquaries. Mr. Andrews did not confine his attention to this class however, but was interested also in the far different category of Portolan charts, which he had studied with special reference to their delineation of the British Islands, a subject discussed by him in various papers in our own *Journal* and elsewhere. As an Irishman he was also specially concerned with the mapping of Ireland down to later times, a useful résumé of which was printed in the *Proceedings* of the Belfast Natural History and Philosophical Society, Session 1923-24, as read before that Society in December 1922.

Mr. Andrews was a valued member of various learned societies, and having joined our own in 1919, was a generous donor to its collections of photographs of important maps of which he possessed negatives.

In accordance with his wish, his wife and sister have offered the whole of his collections to the Society, and this offer has been gratefully accepted by the Council. At the time of writing the Librarian is in Belfast to arrange for the transport of this munificent gift, which will be of the greatest value to students of early cartography.

E. H.

CORRESPONDENCE

CHANGES IN THE PHYSICAL GEOGRAPHY OF EAST AFRICA IN HUMAN TIMES

Having started the investigation and study of this subject in Uganda nearly sixteen years ago, and having pursued it ever since, thus making it my own, I was much interested by Dr. Leakey's paper in the *Journal* for October last, on which I should like to offer a few comments:

(1) There is no North-Eastern Province of Uganda; but that is a detail. I mention it so that the slip may not be perpetuated.

(2) Dr. Leakey's contention (pp. 299-300) that there are no remains of earlier Stone Age cultures above the 600-foot contour whereas those of later periods abound in such high positions, and that this is indicative of a downward shift of the colder zones in early Pleistocene days is a bold assertion, but I am not in a position to dispute it. In another place however (p. 301) Dr. Leakey claims elevation to the extent of 4000 feet during human times. As early man was in East Africa at the beginning of the Pleistocene, he must (on Dr. Leakey's showing) have known the present 6000 feet ground when it stood at 2000 feet above mean sea-level. The argument thus loses much of its force; for in these circumstances not only should the latest but also the earliest Stone Age cultures be found in positions now more than 6000 feet above the sea—unless their absence (if indeed this absence is a fact) is a consequence of factors other than those that Dr. Leakey has visualized.

(3) Mr. Hopley is dubious about this 4000-foot rise (p. 308). That is not surprising. I would like to point out however that while I am not in a position to express any opinion on the accuracy of Dr. Leakey's estimate in this regard, the fact of major earth-movements in Eastern Central Africa during the Pleistocene is no new discovery. It seemed to be indicated as long ago as 1919, and in 1923 it became certain. In the following year (two years before the East African Archaeological Expedition started its work) I stated in *Man* (Article 124) that faulting with a vertical throw of more than 1000 feet had taken place in the Albertine rift in human times. There have been some decidedly great uplifts

since the beginning of Pleistocene days, and the correctness or incorrectness of Dr. Leakey's contention must be determined by the evidence.

(4) As to the vast lake of Lower Pleistocene days depicted by Dr. Leakey in Fig. 2 of his paper, I must confess myself doubtful, but I do not think that the meteorological difficulties in the way of its acceptance are so great as Dr. Worthington supposes (p. 306). Moreover, it should be noted that a thickness of 1000 feet of sediment does not of necessity indicate a deep lake in a rift valley.

(5) While I am not qualified to pronounce upon the size of this lake I do not agree with Mr. Hobley that, were it at one time 100 miles wide, rift valley faults should be found at that distance apart. Is it not a fact that some of the Rift Valley faults pass into flexures before fading out? Why then should the original depression have been bounded by faults?

(6) I am afraid I cannot agree with Dr. Leakey's reconstruction of lower Pleistocene geography so far as Uganda is concerned; but the matter is too lengthy to discuss in this letter. I would like to say however I agree with Dr. Worthington that during the interpluvial period Lake Victoria dwindled drastically. Indeed, for all practical purposes, it may be considered to have dried up.

A copy of a publication of mine on "The Physiographical Evolution of the Lake Victoria Basin" (*Uganda Herald*, 17, 24, and 31 March 1933) was lodged with the Society about eighteen months ago for the benefit of any one interested in the subject. Another paper on "Rifts, Rivers, Rains, and Early Man in Uganda," which is at present the most up-to-date pronouncement on the matter, will probably be printed in the second part (July to December) of vol. lxiv of the *Journal of the Royal Anthropological Institute* for 1934. (This paper was to have been read at the British Association this year; but I withdrew it because, at the last moment, I was prevented from going to Aberdeen.)

E. J. WAYLAND

Ramsgate. 21 October 1934.

DATE OF THE NEXT INTERNATIONAL GEOGRAPHICAL CONGRESS

We have been asked to publish the following letter addressed to Sir Charles Close by Dr. Isaiah Bowman, who, as President of the International Geographical Union, presided at the Warsaw Congress and also at the meetings in Warsaw of the General Assembly of the International Geographical Union.

Sir Charles Close,
President, International Geographical Union,
Winchester, England.

MY DEAR SIR CHARLES,

In reply to your inquiry respecting the decision of the International Geographical Union on the date of the next International Geographical Congress, may I say that it was formally decided at the first meeting of the Assembly on August 22 to hold the next Congress at Amsterdam in 1938.

At the opening of that meeting I called attention to the principle that, in general, decisions are taken at the second meeting of the Assembly, not at the first. I went on to say however that two matters could be decided at the first session, the date and place of the next Congress, because there was but one invitation before us, that of the Government of the Netherlands, and prior consultation had shown a marked if not a unanimous preference for a longer interval between congresses.

After the vote was taken I stated that the Congress would be informed of our decision at its final session, and I announced the matter accordingly on August 31. My original agenda papers are quite clear and consistent on these points. I am sending copies of them to Professor de Martonne for the permanent records and the originals go to you herewith for verification.

Sincerely yours,

ISAIAH BOWMAN

New York. 8 November 1934.

MEETINGS: SESSION 1934-35

First Evening Meeting, 12 November 1934. The President in the Chair

Elections: Maqbul Ahmed, B.A.; Patrick Douglas Baird, B.A.; Harry William Barter; Oswald D. Bason; Miss Gertrude Berridge; Sqdn.-Commr. George Fred. Breese, D.S.C.; Bernard Dearman Burt; William Ogilvie Campbell; Frederick G. Clapp; W. Wallace Clark; Lieut. Meysey George Dallas Clive; Stanley Jackson Coleman; The Rev. Clifford John Cottle, M.B.E.; Allan L. Crockford, M.C.; F. J. Davar; Miss Dora H. de Beer; Mrs. Frances Stuart Denison; R. D. Dikshit, B.A.; Prof. Agnes C. L. Donohugh; Robert Morton Dyer, C.B.E., B.Sc.; Charles Elton; Leslie W. Evans; Miss Constance Mary Exley; Lieut. Walter Edmund Fletcher, R.N.; Edward Flewitt; The Countess Helle Frijs; William G. Gerhard; The Hon. Mrs. Geoffrey Pursell Gilpin; Frank Henry Winn Green; Cyril Eric Hamshere; Sir John Ludlow Hanham, Bart.; Miss Christine Isabel Barron Henman; W. J. A. Herbert; Captain Robert Edwin Holden; Walter Ronald Holman; Samuel Hubbard; Robert Mandeville-Humfrey; C. Stewart Hunter, M.A., L.R.C.P.E., L.R.C.S.E., D.P.H.; Adhemar Melville-Jackson; Kishore Chand Jhingan, M.A.; Ronald Henry Keith Johnson; Norman Stuart Carey Jones, B.A.; Cyril Bert Judson, B.A.; Henri Jullerot; David Buchanan Keith; Captain Edward Orlando Kellett; Herbert Kendrick; Lieut. C. E. Keys, R.N.; Major Edward Latham, M.C.; Maung Aye Maung, B.A.; Anton K. Money; Thomas Glynn Morris, M.D., B.S., F.G.S.; The Rev. William Ralph Morris, M.A.; Sirish Chandra Mukerjee; Henry Hugh Munro; Rear-Admiral P. L. H. Noble, C.B., C.V.O.; Captain John William Parkin; Thomas Thomson Paterson, B.Sc.; Miss Margaret Paynter; Vishwanath Laxman Phatak; Cecil A. Pickering; Herbert Bower Platt; Mrs. Mary Mona Ponder; Raymond Donne Aufrere Puckle; H. E. Douglas-Pulleyne; George Rathbone; H. Richardson; Montgomery Harrison Wadsworth Ritchie, B.A.; Leonard Frank Robinson; Dr. Joseph F. Rock; Noel Yvri Sandwith; Miss Irene M. Scott, B.A.; W. L. Seaborne; Hugh John Annand Seaton; Miss Maria G. Shaw; Lionel Barrington Simeon; John Gerard Madden Simpson; Mrs. Mary S. R. Sinclair; F. E. Stafford; Edmund Stewart Stanley, M.A.; J. L. Starkey; Miss Hilda Violet Stuart; Reginald W. Sturt; Captain Godfrey Carlill Teale; Luke William Burke Teeling; Wilfred Patrick Thesiger; Captain Woodbridge Strong Van Dyke; Russell Edward Vickers; Frank Richard Green Webb; Donald Wees; The Rev. Peter Were; Philip Lewis Woodwark; Major Sir Hubert Winthrop Young, K.C.M.G., D.S.O.; Lady Young; John Alfred Young

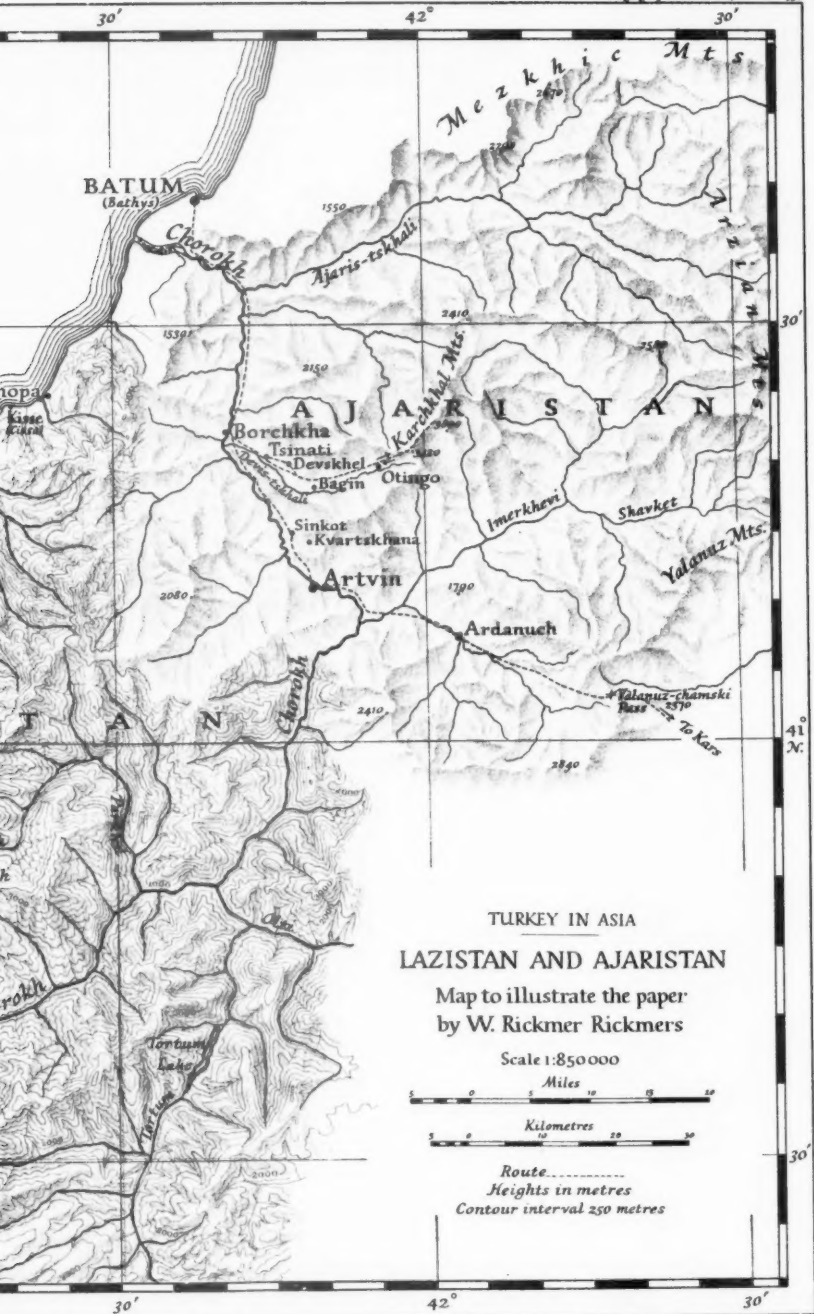
Paper: The Awash River and the Aussa Sultanate. By Mr. Wilfred Thesiger

First Afternoon Meeting, 19 November 1934. The President in the Chair

Paper: The Study of Threatening Glaciers. By Professor Kenneth Mason

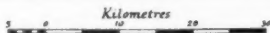






TURKEY IN ASIA
LAZISTAN AND AJARISTAN
 Map to illustrate the paper
 by W. Rickmer Rickmers

Scale 1:850000

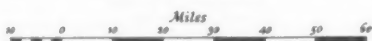


Route
 Heights in metres
 Contour interval 250 metres

WEST. & CENT. AUSTRALIA

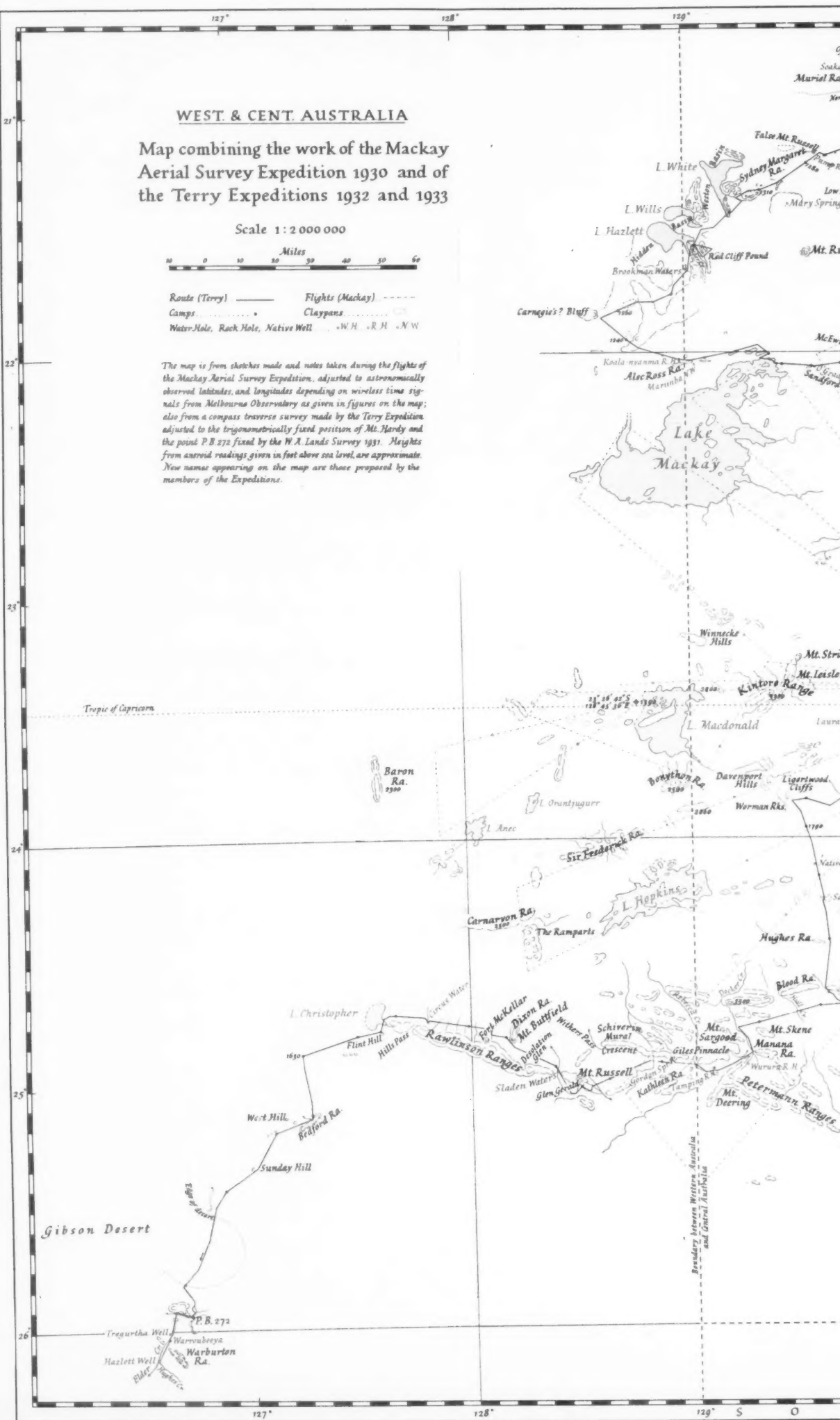
Map combining the work of the Mackay Aerial Survey Expedition 1930 and of the Terry Expeditions 1932 and 1933

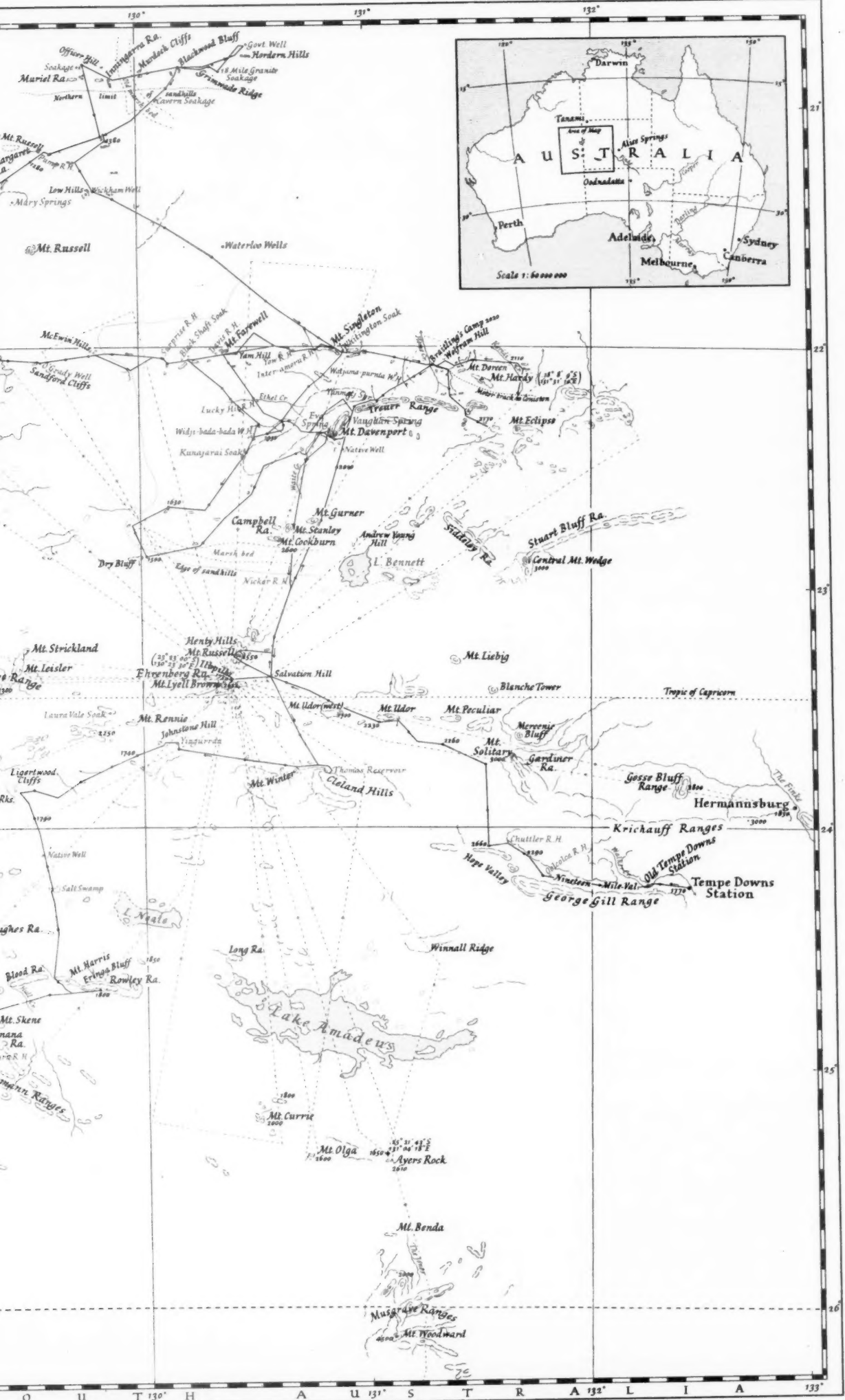
Scale 1:2 000 000



Route (Terry) ——— Flights (Mackay) - - - -
 Camps Claypans
 Water-Hole, Rock Hole, Native Well . . . W.H. . R.H. . N.W.

The map is from sketches made and notes taken during the flights of the Mackay Aerial Survey Expedition, adjusted to astronomically observed latitudes, and longitudes depending on wireless time signals from Melbourne Observatory as given in figures on the map; also from a compass traverse survey made by the Terry Expedition adjusted to the trigonometrically fixed position of Mt. Hardy and the point P.B. 272 fixed by the W.A. Lands Survey 1931. Heights from aneroid readings given in feet above sea level, are approximate. New names appearing on the map are those proposed by the members of the Expeditions.







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